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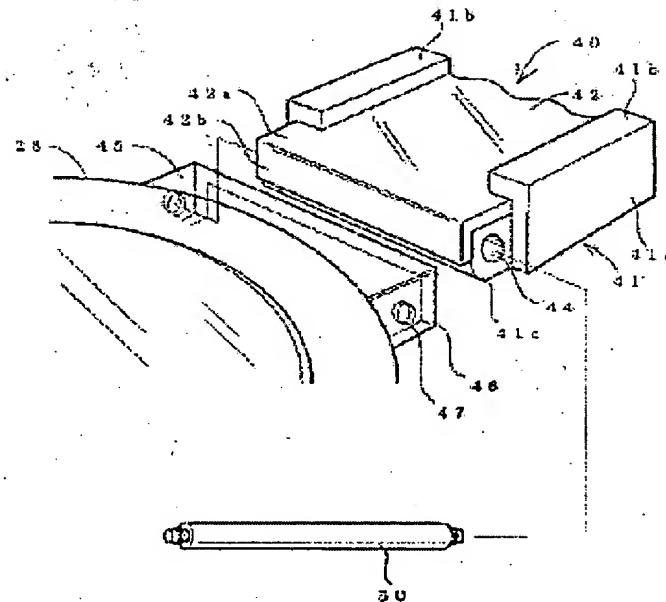
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**THERMAL POWER GENERATING TYPE ELECTRONIC DEVICE****Patent number:** JP2001174576**Publication date:** 2001-06-29**Inventor:** TAKIE JIYUNSUKE**Applicant:** CITIZEN WATCH CO LTD**Classification:****- international:** G04C10/00; A45C5/00; G04G1/00; H01L35/30;  
H02N11/00**- european:****Application number:** JP19990364051 19991222**Priority number(s):****Abstract of JP2001174576**

**PROBLEM TO BE SOLVED:** To provide a structure enhancing the power generating efficiency of a thermo-element.

**SOLUTION:** This electronic device is provided with a case 21 composed of a heat insulating material, a bezel fixed to the top of the case and composed of a heat conductive material, a rear lid 24 fixed to the bottom of the case and composed of a heat conductive material, and the thermo-element 26 arranged heat-conductively to the bezel and the rear lid. This portable electronic device is characterized to have a band having a band member composed of a heat conductive material and increasing the temperature difference between the bezel and the rear lid.



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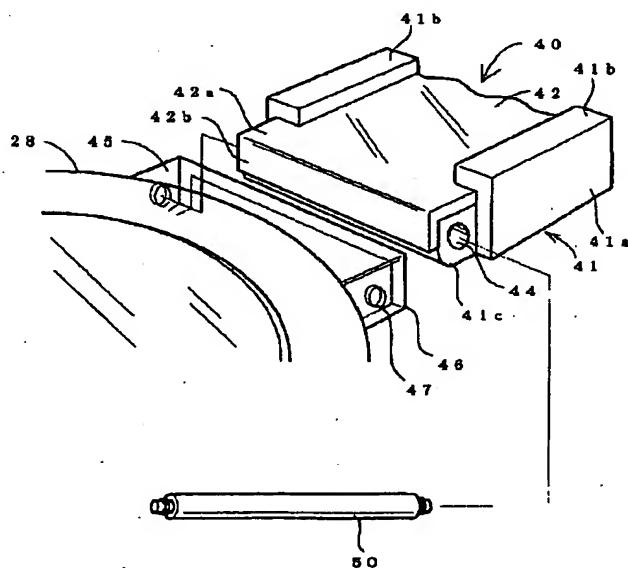
2F084 AA00 AA05 JJ02

(54)【発明の名称】 热発電式電子機器

(57)【要約】

【課題】 热電素子の発電効率を高めることのできる構造を得る。

【解決手段】 断熱性材料よりなるケース21と、そのケースの上部に固定され、热伝導性材料よりなるベゼル28と、ケースの下部に固定され、热伝導性材料よりなる裏蓋24と、ベゼルと裏蓋とに热伝導可能に配置された热電素子26とを有し、热伝導性材料よりなり、ベゼルと裏蓋との温度差を増大させるバンド部材を有するバンドとを備えたことを特徴とする携帯用電子機器。



熱電素子6が配置される。熱電素子6それぞれは、電気的に直列に連結され、その列の両端はムーブメント5に導通する。ムーブメント5の上面には文字板14が載置される。

【0004】また、その腕時計は、断熱性材料よりなる円筒状のケース1と、熱伝導性材料よりなる円板状の裏蓋4と、断熱性材料よりなるベゼル8とを備える。ケース1の内部にムーブメント5が収納される。防水用パッキン2を介して、4本のねじ3により、ケース1に裏蓋4が固定される。さらに、防水用パッキン13を介して、4本のねじ7により、ケース1にベゼル8が固定される。ベゼル8には風防10が固定される。

【0005】このとき、腕時計を上から見た、すなわち文字板14側から見た平面視において、ねじ3とねじ7の位置は、上下に一致しないように配置される。よって、腕時計の上下方向に沿った厚みを薄くできる。

【0006】図16に示すように、各ねじ7はケース1に形成された段付孔11に挿入されて、その孔11の一つにコイルスプリング12が挿入される。スプリング12の下端が裏蓋4に、上端がねじ7の頭部に圧接される。

【0007】ケース1が電気的にも絶縁材であるため、ベゼル8に発生する静電気が文字板14を介して、ムーブメント5に流れる危険がある。すると、静電気により、ムーブメント内部のICが破壊される。

【0008】これを防ぐためにコイルスプリング12が配置される。ベゼルに発生する静電気は、固定ねじ7からコイルスプリング12、コイルスプリングから裏蓋4、裏蓋から手首へと流れる。よって、静電気によって、ムーブメントが破壊されるのが防止される。

【0009】このような腕時計は、手首の体温によって温められる裏蓋4と、外気によって冷やされたベゼル8との間の温度差によって、熱電素子6に起電力が生じる。これにより、時計のムーブメントを駆動する。

【0010】従って、熱電素子の発電効率を高めるには、高い熱伝導効率を維持できるように、熱電素子6を裏蓋4とベゼル8に接続させる必要がある。すなわち、手首の体温を熱電素子6に伝達させるために、熱電素子を裏蓋4に密着させ、また、外気温を熱電素子に伝達するために、熱電素子をベゼル8に密着させる必要がある。

#### 【0011】

【発明が解決しようとする課題】しかしながら、従来の熱発電式腕時計にあっては、下記のような問題がある。

(1) 放熱器であるベゼルと外気との接触面積が小さいので、ベゼルが充分に空気冷却されない。従って、ベゼルと裏蓋の間に大きな温度差が発生しないので、熱電素子からムーブメントを駆動させるに充分な電力を得られない。

(2) 集熱器である裏蓋と手首との接触面積も小さいの

で、裏蓋が体温によって充分に温められない。従って、ベゼルと裏蓋の間に大きな温度差が発生しないので、熱電素子からムーブメントを駆動させるに充分な電力を得られない。

【0012】従って、本発明の第一の目的は熱電素子の発電効率を高めることのできる電子機器を得るにある。第二の目的はベゼルの放熱効果を高めること、第三の目的は裏蓋の集熱効果を高めることのできる電子機器を得るにある。

#### 【0013】

【課題を解決するための手段】請求項1による発明は、断熱性材料よりなるケースと、そのケースの上部に固定され、熱伝導性材料よりなるベゼルと、ケースの下部に固定され、熱伝導性材料よりなる裏蓋と、ベゼルと裏蓋とに熱伝導可能に配置された熱電素子と、熱伝導性材料よりなり、ベゼルと裏蓋との温度差を増大させる増進部材を備えたバンドとよりなることを特徴とする。このような構成により、熱電素子の発電効率を高めることができる。

【0014】請求項2による発明は増進部材が外方に露出する放熱バンド部材で、その放熱バンド部材がベゼルと熱伝導可能に連結されたことを特徴とする。この構成により、ベゼルの熱がバンドの放熱部材に伝わり、ベゼルばかりかバンドの放熱部材からも放熱される。従って、従来よりベゼルの温度が低くなり、手首によって温められる裏蓋との温度差が大きくなる。その結果、熱電素子の発電効率を高めることができる。

【0015】請求項3による発明は、増進部材が熱伝導性材料よりなり、手首と接触可能な集熱バンド部材で、その集熱バンド部材が裏蓋と熱伝導可能に連結されたことを特徴とする。かかる構成により、バンドの集熱部材の熱が裏蓋に伝わるので、手首のほぼ全周の体温を裏蓋に集めることができる。よって、従来より裏蓋の温度が高くなるので、空気によって冷却されるベゼルとの温度差が大きくなる。その結果、熱電素子の発電効率を高めることができる。

【0016】請求項4の発明は、放熱バンド部材がバンドの表側に向けて露出する。従って、放熱部材と手首とが接触しないので、放熱部材に体温が伝わらない。これにより、放熱部材が体温で温められないので、高い空冷効果を維持できる。

【0017】請求項5の発明はバンドの裏側が、断熱性材料よりなる断熱部材で覆われる。従って、バンドが手首に接触しても、手首の体温が断熱部材で阻まれて放熱部材に伝わらない。これにより、放熱部材が体温で温められないので、高い空冷効果を維持できる。

【0018】請求項6の発明は、バンドにおけるベゼルとの連結部近傍に位置する放熱部材の一部が、ベゼルと熱伝導可能に接触する。これにより、放熱部材が確実にベゼルと熱伝導可能に接触する。

によって覆われる。さらに、断熱バンド部材41におけるバンドの長手方向に沿った側壁部41aと表側の縁部41bが、放熱バンド部材42における長手方向に沿った外縁それぞれの側面と表側を覆う。そして、貫通孔43に断熱バンド部材41の素材が入り込む。これにより、放熱バンド部材42と断熱バンド部材41の結合の強度が大きくなる。

【0040】このようにして、放熱バンド部材42の表側は、断熱バンド部材41に覆われた外縁近傍を除き、バンド40の表側に露出して外気に接触する。バンド40の裏側は、断熱バンド部材41に覆われるので、手首の体温は断熱バンド部材41に阻まれて、放熱バンド部材42に伝わらない。また、外縁が断熱バンド部材41に覆われるので、放熱バンド部材42が携帯者の手首を傷つけることはない。また、断熱バンド部材41の縁部41bは、放熱バンド部材42より表側に向けて突出する。よって、バンド40の表側をどこかにぶつけても、縁部41bに保護されて、露出した放熱バンド部材42が傷つきにくい。バンド40はベゼル28に連結される。図4と図6に、バンドにおけるベゼル28との連結部分が示される。断熱バンド部材41の本体が長手方向に突出して連結部41cが形成される。連結部41cに横方向の連結用貫通孔44が形成される。

【0041】一方、放熱バンド部材42の基端部が、断熱バンド部材41より突出して連結部41c上に延び、さらに連結部41cに沿って裏側に向けて折れ曲げられる。そして、連結部41cの表側に位置する接触部42aと、連結部41cの側面に位置する接触部42bが形成される。他方、ベゼル側の連結部分には庇45と両側壁46が突出して形成される。両側壁には貫通孔44に対向する孔47が形成される。図6に示すように、接触部42aと42bを含むバンド40の連結部分が、ベゼルの両側壁46の間に挿入される。ばね棒50が孔47、44に挿入され、バンド40がベゼル28に連結される。このとき、放熱バンド部材42の接触部42aは庇45に圧接し、接触部42bはベゼルの周壁51に圧着される。従って、接触部42a、42bが広い面積でベゼルに接触される。また、放熱バンド部材42の接触部42aと42bは、ベゼル28に形成された庇45の裏面側に位置するので、携帯者から見えないので、腕時計の外観を損ねることがない。

【0042】このような構造であるから、ベゼル28の熱が、接触部42aと42bを通して、バンド40の放熱バンド部材42に伝わる。放熱バンド部材42は、空気冷却される。よって、ベゼル28ばかりでなく放熱バンド部材42からも放熱される。従って、従来よりベゼル28の温度が低くなり、手首によって温められる裏蓋24との温度差が大きくなる。結果として、熱電素子26の発電効率を高めることができる。

【0043】(第二の実施形態) 図8は本発明の第二の

実施形態を示す分解斜視図、図9は長手方向断面図、図10は横方向断面図である。図8は腕時計の一部を裏から見たものである。第二の実施形態は時計の裏蓋の集熱効率を上げることを計る。図8及び図9に示すように、バンド60は、バンド表側の断熱バンド部材61と裏側の集熱バンド部材62となりなる。

【0044】集熱バンド部材62は、ステンレス、チタン、黄銅、アルミニウムなどの熱伝導性の高く、また湾曲可能な薄さの金属板で作られる。図10に示すように、集熱バンド部材62の長手方向両側の外縁に多数の貫通孔63が形成される。断熱バンド部材61は、プラスチック材やゴム材などの断熱性が高く、柔軟な素材で作られる。例えば、断熱バンド部材61は、熱伝導性の低い合成樹脂であるポリカーボネイトで作られる。

【0045】集熱バンド部材62が断熱バンド部材61にインサート成形されて、バンド60が構成される。図8及び図10に示すように、断熱バンド部材61が、集熱バンド部材62におけるバンドの長手方向に沿った両側の外縁近傍の側面と裏面を覆い、抱え込み部64が形成される。そして、インサート成形のとき、貫通孔63に断熱バンド部材61の合成樹脂が入り込み、これにより集熱バンド部材と断熱バンド部材が強く結合される。

【0046】一方、集熱バンド部材62の裏面には、バンド横方向に延びる多数の突起による接触部65が形成される。接触部65は、抱え込み部64の間に位置して、バンドの長手方向に沿い、一定の間隔をもって連続して形成される。複数の接触部65は、バンド60の裏面全周にわたって形成することが好ましい。また、図9、10に示すように、接触部65は抱え込み部64よりバンド60の裏側に向けて突出する。よって、腕時計を手首に装着したとき、複数の接触部65は肌に接触できる。

【0047】バンド60におけるベゼル59との連結部分は、図8にも示される。断熱バンド部材61の本体が長手方向に突出して連結部61aが形成される。連結部61aに横方向に沿って連結用貫通孔66が穿設される。一方、集熱バンド部材62の基端部が断熱バンド部材61の連結部61aより突出して連結部62aが形成される。連結部62aを表裏に貫通する2つの孔74が横方向に並ぶ。

【0048】他方、ベゼル59側の連結部分には、庇67と、庇67より垂下する両側壁68が突出して形成される。両側壁68には貫通孔66に対向する孔70が形成されている。バンド60の断熱バンド部材61の連結部61aは、図9に示すようにベゼル59の庇67と側壁68との間に挿入され、ばね棒71が孔70、66に挿入され、バンドがベゼル59に連結される。

【0049】そして、集熱バンド部材62の連結部62aの基端部は、裏蓋72の凹部73に挿入される。連結部62aに形成された二個の孔74に通されたねじ76

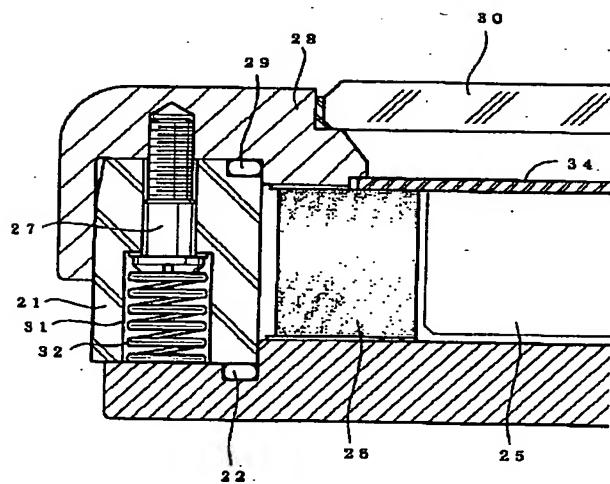
【図17】図15における裏蓋固定ねじを通る線に沿う  
断面図。

## 【符号の説明】

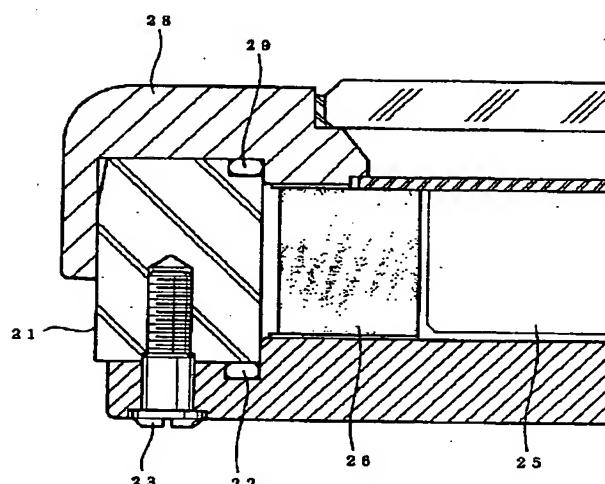
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- 2 防水用パッキン
- 3 ねじ
- 4 裏蓋
- 5 ムーブメント
- 6 热電素子
- 7 ねじ
- 8 ベゼル
- 10 風防
- 11 孔
- 12 コイルスプリング
- 14 文字板
- 21 ケース
- 22 防水用パッキン
- 23 ねじ
- 24 裏蓋
- 25 ムーブメント
- 26 热電素子
- 27 ねじ
- 28 ベゼル
- 29 防水用パッキン
- 30 風防
- 31 孔
- 32 コイルスプリング
- 34 文字板
- 40 バンド
- 41 断熱バンド部材
- 41a 両側壁部

- 41b 上部両縁部
- 41c 連結部
- 42 放熱バンド部材
- 42a、42b 接触部
- 43 孔
- 44 孔
- 45 底
- 46 側壁
- 47 孔
- 50 ばね棒
- 51 周壁
- 59 ベゼル
- 60 バンド
- 61 断熱バンド部材
- 61a 連結部
- 62 集熱バンド部材
- 62a 連結部
- 65 接触部
- 66 孔
- 67 底
- 68 側壁
- 70 孔
- 71 ばね棒
- 72 裏蓋
- 73 凹部
- 74 孔
- 76 ねじ
- 78 孔
- 80 左側のバンド
- 81 右側のバンド

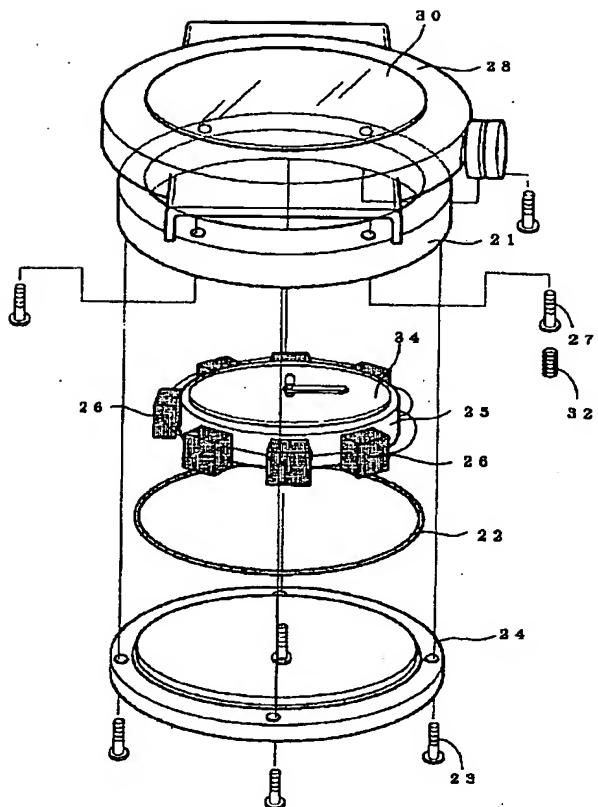
【図2】



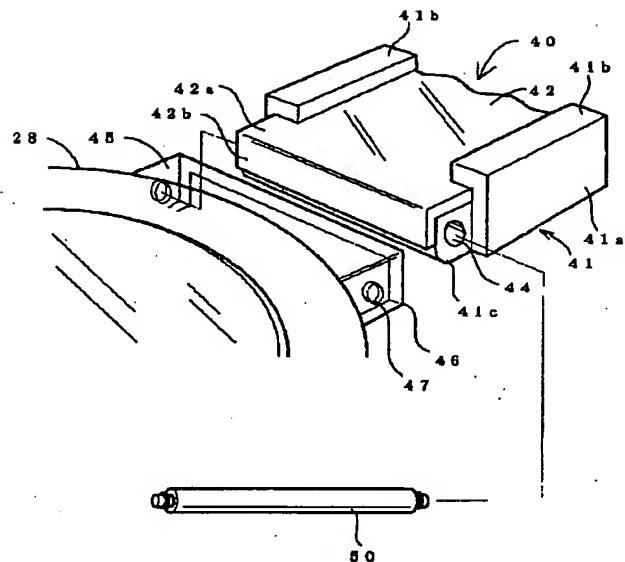
【図3】



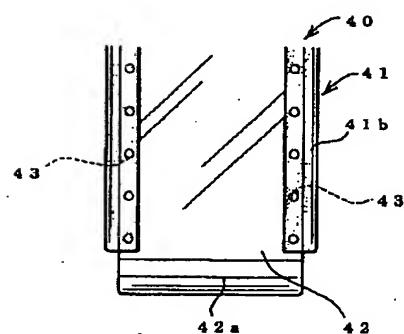
【図1】



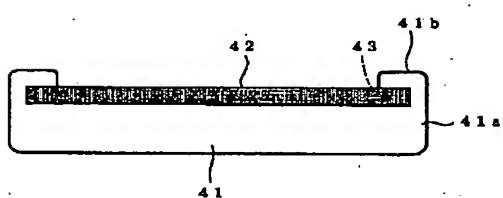
【図4】



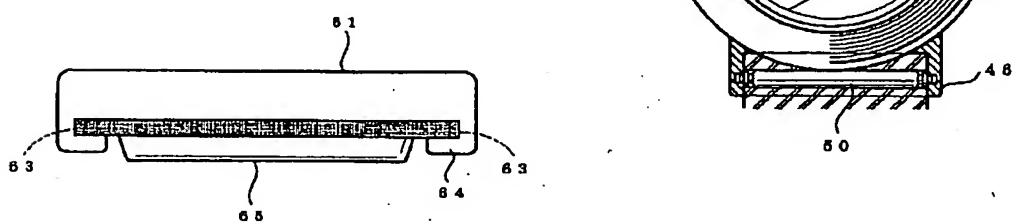
【図5】



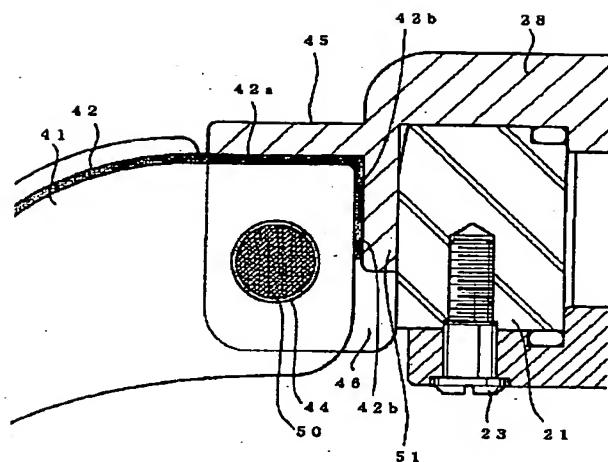
【図7】



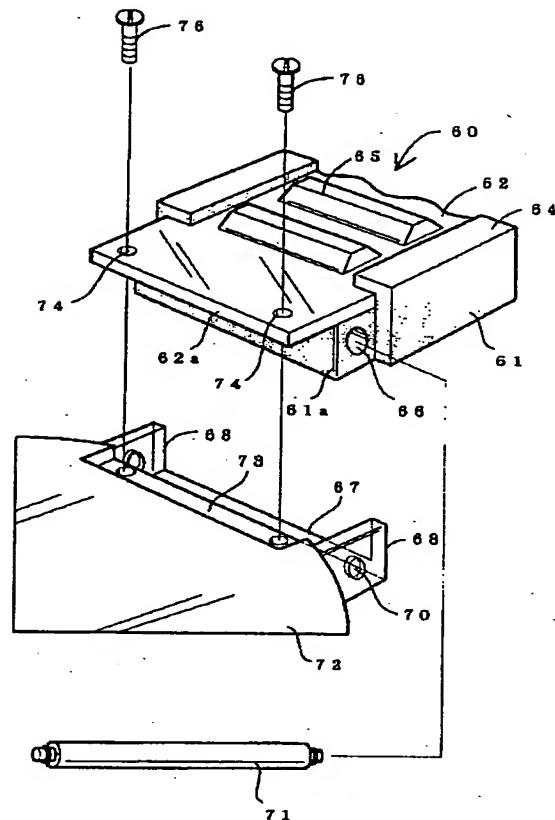
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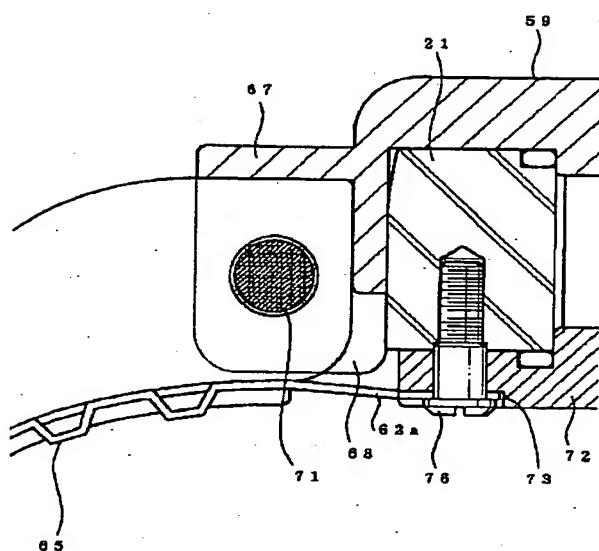
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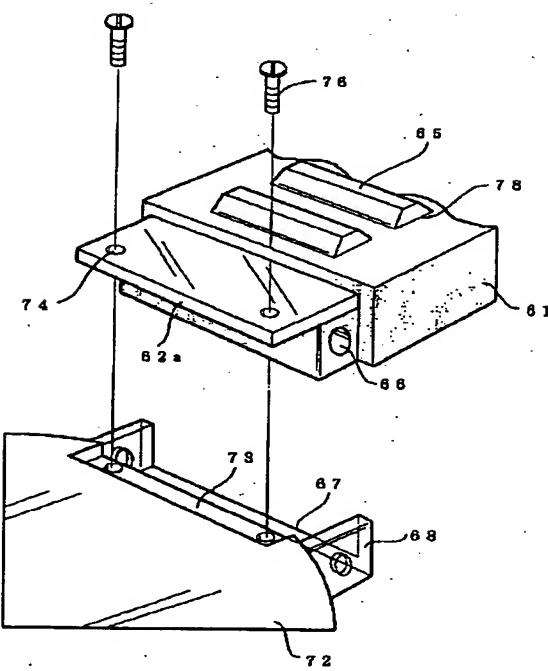
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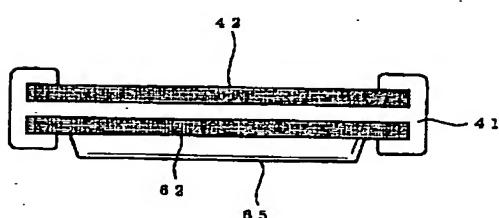
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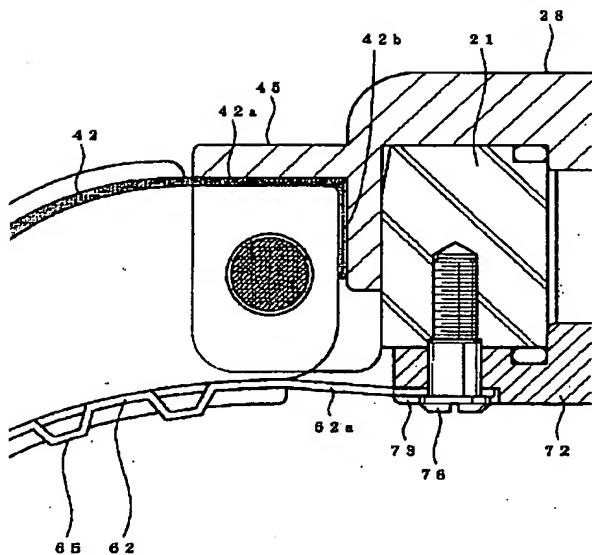
【図11】



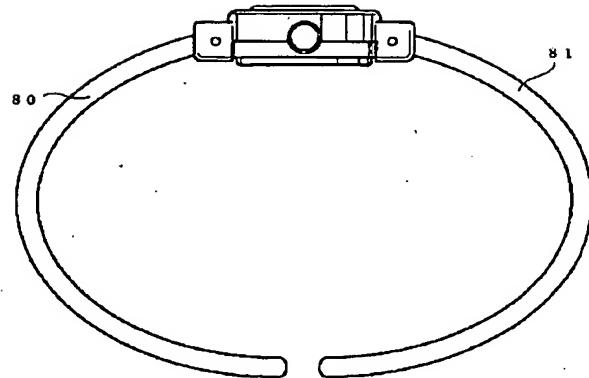
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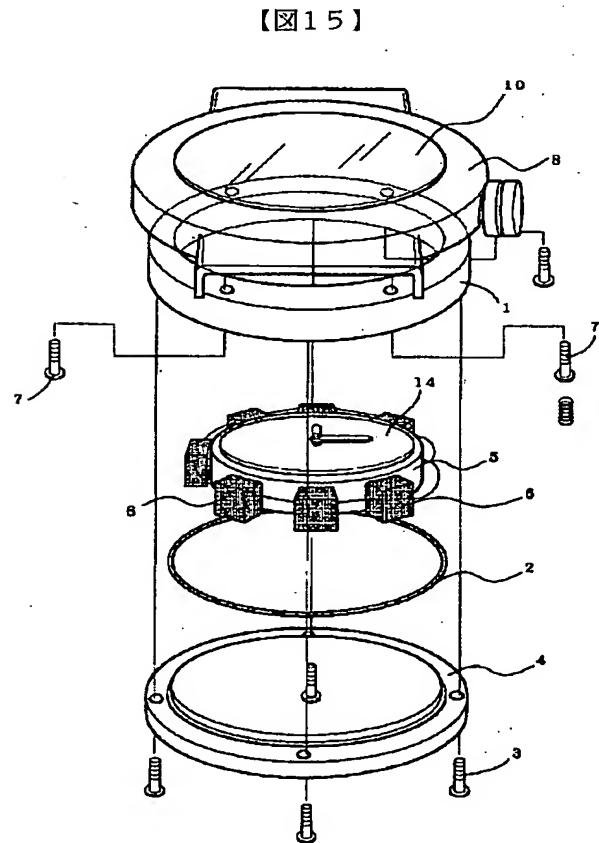
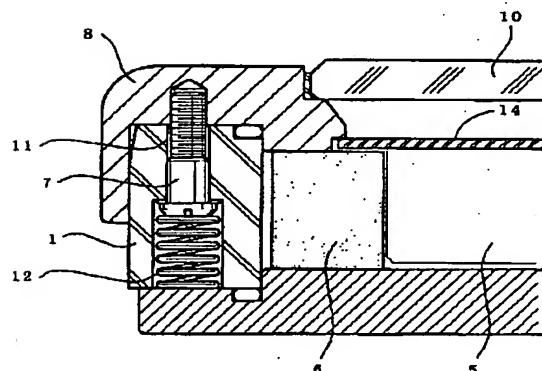
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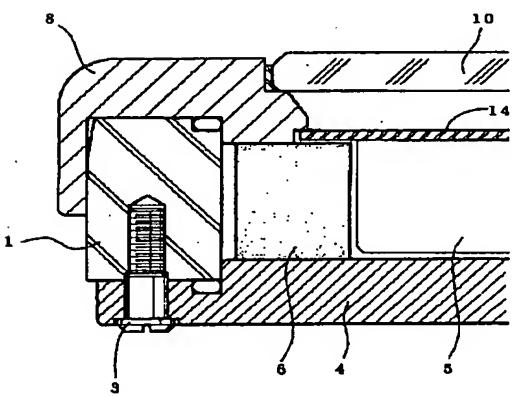
【図14】



【図16】



【図17】



# EUROPEAN PATENT OFFICE

## Patent Abstracts of Japan

PUBLICATION NUMBER : 2001174576  
PUBLICATION DATE : 29-06-01

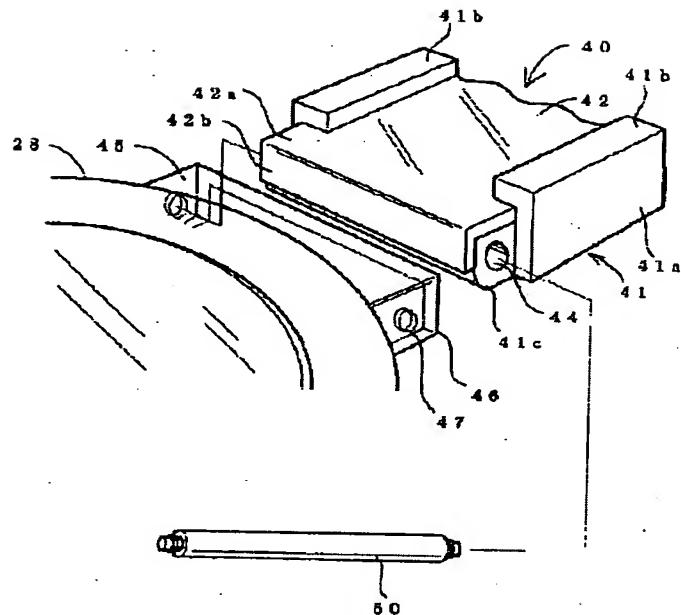
APPLICATION DATE : 22-12-99  
APPLICATION NUMBER : 11364051

APPLICANT : CITIZEN WATCH CO LTD;

INVENTOR : TAKIE JIYUNSUKE;

INT.CL. : G04C 10/00 A45C 5/00 G04G 1/00  
H01L 35/30 H02N 11/00

TITLE : THERMAL POWER GENERATING  
TYPE ELECTRONIC DEVICE



ABSTRACT : PROBLEM TO BE SOLVED: To provide a structure enhancing the power generating efficiency of a thermo-element.

SOLUTION: This electronic device is provided with a case 21 composed of a heat insulating material, a bezel fixed to the top of the case and composed of a heat conductive material, a rear lid 24 fixed to the bottom of the case and composed of a heat conductive material, and the thermo-element 26 arranged heat-conductively to the bezel and the rear lid. This portable electronic device is characterized to have a band having a band member composed of a heat conductive material and increasing the temperature difference between the bezel and the rear lid.

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2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

**DETAILED DESCRIPTION**

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the portable electronic device equipped with the thermo-electric generating element generated according to a temperature gradient. It is related with the heat generation-of-electrical-energy type electronic equipment especially carried by arms, such as a wrist watch.

[0002]

[Description of the Prior Art] The decomposition perspective view in which drawing 15 shows such a wrist watch, drawing 16, and 17 are the sectional views in a different part, respectively.

[0003] Along with the side-face periphery of the movement 5 contained by the wrist watch, many thermoelements 6 are arranged so that a movement 5 may be surrounded. A thermoelement 6 -- each is electrically connected with a serial and it flows through the both ends of the train in a movement 5. A dial 14 is laid in the top face of a movement 5.

[0004] Moreover, the wrist watch is equipped with the disc-like back lid 4 which serves as the case 1 of the shape of a cylinder which consists of an adiathermic ingredient from a thermally conductive ingredient, and the bezel 8 which consists of an adiathermic ingredient. A movement 5 is contained inside a case 1. The back lid 4 is fixed to a case 1 with four screw threads 3 through the packing 2 for waterproofing. Furthermore, a bezel 8 is fixed to a case 1 with four screw threads 7 through the packing 13 for waterproofing. A windshield 10 is fixed to a bezel 8.

[0005] At this time, in the plane view which looked at the wrist watch from the top, namely, looked at it from the dial 14 side, it \*\*\*\*'s with \*\*\*\* 3, and the location of 7 is arranged so that it may not be in agreement up and down. Therefore, thickness which met in the vertical direction of a wrist watch can be made thin.

[0006] As shown in drawing 16, each \*\*\*\* 7 is inserted in the stepped hole 11 formed in the case 1, and a coil spring 12 is inserted in one of the hole 11 of the. Upper limit \*\*\*\*'s on the back lid 4, and the pressure welding of the lower limit of a spring 12 is carried out to it on the head of 7.

[0007] Since a case 1 is an insulating material also electrically, there is risk of static electricity generated in a bezel 8 flowing to a movement 5 through a dial 14. Then, IC inside a movement is destroyed by static electricity.

[0008] In order to prevent this, a coil spring 12 is arranged. Static electricity generated in a bezel flows from a lock screw 7 from the back lid 4 from a coil spring 12 and a coil spring, and a back lid to a wrist. Therefore, it is prevented by static electricity that a movement is destroyed.

[0009] Electromotive force produces such a wrist watch in a thermoelement 6 according to the temperature gradient between the back lid 4 which can be warmed according to the temperature of a wrist, and the bezel 8 cooled by the open air. This drives the movement of a clock.

[0010] Therefore, in order to raise the generating efficiency of a thermoelement, it is necessary to connect a thermoelement 6 to the back lid 4 and a bezel 8 so that high heat-conduction effectiveness can be maintained. That is, in order to stick a thermoelement on the back lid 4 in order to make the temperature of a wrist transmit to a thermoelement 6, and to make outside air temperature transmit to a thermoelement, it is necessary to stick a thermoelement to a bezel 8.

[0011]

[Problem(s) to be Solved by the Invention] However, if it is in the conventional heat generation-of-

electrical-energy type wrist watch, there are the following problems.

(1) Since the touch area of the bezel and the open air which are a radiator is small, air quenching of the bezel is not fully carried out. Therefore, since a big temperature gradient does not occur between a bezel and a back lid, sufficient power for making a movement drive cannot be obtained from a thermoelement.

(2) Since the touch area of the back lid and wrist which are a solar collector is also small, a back lid cannot fully warm according to temperature. Therefore, since a big temperature gradient does not occur between a bezel and a back lid, sufficient power for making a movement drive cannot be obtained from a thermoelement.

[0012] Therefore, the first purpose of this invention is to obtain the electronic equipment which can raise the generating efficiency of a thermoelement. The second purpose's heightening the heat dissipation effectiveness of a bezel and the third purpose are to obtain the electronic equipment which can heighten the collection-of-heat effectiveness of a back lid.

[0013]

[Means for Solving the Problem] Invention by claim 1 is characterized by to be fixed to the upper part of the case which consists of an adiathermic ingredient, and its case, to be fixed to the bezel which consists of a thermally conductive ingredient, and the lower part of a case, to become the back lid which consists of a thermally conductive ingredient, and a bezel and a back lid from the thermoelement arranged possible [ thermal conduction ] and a thermally conductive ingredient, and to consist of a band equipped with the improvement member which increases the temperature gradient of a bezel and a back lid. Such a configuration can raise the generating efficiency of a thermoelement.

[0014] Invention by claim 2 is the heat dissipation band member which an improvement member exposes to the method of outside, and the heat dissipation band member is characterized by connecting with a bezel possible [ thermal conduction ]. By this configuration, the heat of a bezel radiates heat also from propagation and the radiator material of about a bezel and a band to the radiator material of a band. Therefore, the temperature of a bezel becomes low conventionally and a temperature gradient with the back lid which can be warmed by the wrist becomes large. Consequently, the generating efficiency of a thermoelement can be raised.

[0015] An improvement member consists of a thermally conductive ingredient, and invention by claim 3 is a wrist and the collection-of-heat band member which can be contacted, and is characterized by connecting the collection-of-heat band member with a back lid possible [ thermal conduction ]. since the heat of the collection-of-heat member of a band gets across to a back lid by this configuration -- a wrist -- the temperature of the perimeter can be mostly brought together in a back lid. Therefore, since the temperature of a back lid becomes high conventionally, a temperature gradient with the bezel cooled by air becomes large. Consequently, the generating efficiency of a thermoelement can be raised.

[0016] A heat dissipation band member exposes invention of claim 4 towards the side front of a band. Therefore, since radiator material and a wrist do not contact, temperature does not get across to radiator material. Thereby, since radiator material cannot warm by temperature, the high air-cooling effectiveness is maintainable.

[0017] Invention of claim 5 is covered by the heat insulation member which the background of a band becomes from an adiathermic ingredient. Therefore, even if a band contacts a wrist, the temperature of a wrist is obstructed by the heat insulation member, and does not get across to radiator material. Thereby, since radiator material cannot warm by temperature, the high air-cooling effectiveness is maintainable.

[0018] Invention of claim 6 contacts possible [ a bezel and thermal conduction ] for a part of radiator material located near the connection section with the bezel in a band. Thereby, radiator material contacts a bezel possible [ thermal conduction ] certainly.

[0019] A part of radiator material contacts the rear face of eaves at which invention of claim 7 was formed in the bezel.

[0020] A part of radiator material of invention of claim 8 contacts the side face of a bezel. Since the touch area of radiator material and a bezel can be made large, the heat-conduction effectiveness of radiator material and a bezel can be raised.

[0021] Invention of claim 9 combines the heat insulation member which turns into radiator material which consists of a metal plate which can curve from flexible synthetic resin or rubber, and is taken as a band.

[0022] For invention of claim 10, a heat insulation member is a wrap near the rim in alignment with the longitudinal direction of the band in radiator material.

[0023] The wrap heat insulation member turned to the side front near the rim of radiator material from radiator material, and invention of claim 11 has projected it. Therefore, it is protected by the heat insulation member, the radiator material which consists of a metal plate cannot get damaged easily, and the fine sight of a portable electronic device can be maintained long.

[0024] As for invention of claim 12, insert molding of the radiator material is carried out to a heat insulation member.

[0025] Invention of claim 14 is covered by the heat insulation member which the side front of a band becomes from an adiathermic ingredient. Since area with which a collection-of-heat member touches air can be made small, air cooling of the collection-of-heat member is hardly carried out. Therefore, the temperature of the collection-of-heat member which was able to be warmed by the wrist is highly maintainable as it is. Moreover, since a heat insulation member protects a side front, a collection-of-heat member cannot get damaged easily.

[0026] Invention of claim 15 touches possible [ a back lid and thermal conduction ] for a part of collection-of-heat member located near the connection section with the bezel in a band.

[0027] Invention of claim 16 is fixed to a back lid possible [ thermal conduction ] by fixed means by which a collection-of-heat member fixes a back lid and a case. This increases components mark and the number of assemblers -- it is fixable rattlingly that there is nothing and possible [ thermal conduction of a collection-of-heat member and a back lid ].

[0028] Invention of claim 17 is arranged in the crevice where the collection-of-heat member was formed in the rear face of a back lid. Thereby, a collection-of-heat member can be certainly positioned on a back lid.

[0029] As for invention of claim 18, a collection-of-heat member does not project in the method of outside [ crevice / of a back lid ]. Therefore, a wrist is not damaged by the rim of a collection-of-heat member.

[0030] Invention of claim 21 has two or more contact sections in which a collection-of-heat member projects towards a background from a heat insulation member. Thereby, a collection-of-heat member and a wrist contact certainly through the contact section. Since a collection-of-heat member can bend between the contact section and the contact section, a band can be flexibly incurvated along with a wrist.

[0031] It is characterized by invention of claim 24 consisting of the heat insulation band member which a band member turns into from an adiathermic ingredient, a heat dissipation belt member which was prepared in the top face, consisted of a thermally conductive ingredient, and was connected with the bezel, and a collection-of-heat band member which was prepared in the inferior surface of tongue of a heat insulation belt member, consisted of a thermally conductive ingredient, and was connected with the back lid. [0032]

[Embodiment of the Invention] (First operation gestalt) The decomposition perspective view showing the wrist watch according [ drawing 1 ] to the first operation gestalt of this invention, drawing 2 , and 3 are the sectional views in a different part, respectively.

[0033] The clock includes the case 21 of the shape of a cylinder which consists of an adiathermic ingredient. The disc-like back lid 24 which consists of a thermally conductive ingredient is fixed to a case 21 with four screw threads 23 through the packing 22 for waterproofing. The bezel 28 which consists of a thermally conductive ingredient is fixed to a case 21 with four screw threads 27 through the packing 29 for waterproofing.

[0034] Many thermoelements 26 are arranged at the periphery of the movement 25 contained in the case. A thermoelement 26 flows electrically in a movement 25. a thermoelement 26 -- each end contacts a bezel 28 and the other end contacts the back lid 24. It lets the windshield 30 fixed to the bezel pass like the conventional wrist watch, and the dial 34 and needle which were laid in the side front of a movement 25 are checked by looking.

[0035] A case 21 is made from heat insulators, such as plastics and rubber. For example, a thermally

conductive low polycarbonate can be used as a material of a case 21. Moreover, a bezel 28 and the back lid 24 can be made from the thermally conductive high metal of stainless steel, titanium, brass, etc. You may make from a thermally conductive high ceramic like sapphire.

[0036] As shown in drawing 2, \*\*\*\* 27 is inserted in the stepped hole 31 formed in the case 21, and is thrust into a bezel 28. The head of a screw thread 27 is caught in the large hole of the path of a stepped hole 31. A coil spring 32 is inserted in one of the holes 31. The upper limit of a spring 32 \*\*\*\*s and the pressure welding of the lower limit is carried out to the back lid 24 on the head of 27. The rim of the back lid 24 closes the \*\*\*\* insertion hole 31. Since a hole 31 is not checked by looking, the fine sight of a clock is not spoiled. Moreover, neither sand nor mud is stuck for a hole 31.

[0037] The decomposition perspective view and drawing 5 which show some wrist watches according [ drawing 4 ] to this invention are the top view, and the band which is the description of this invention is shown. A band 40 consists of the heat insulation band member 41 and the heat dissipation band member 42 on a side front on a background.

[0038] It is made highly [ thermal conductivity ] by the heat dissipation band member 42 with the metal plate of the thinness which can curve. For example, the heat dissipation band member 42 can be made from stainless steel, titanium, brass, aluminum, etc. As shown in drawing 5, many through tubes 43 are continued and formed in both the edges in alignment with the longitudinal direction of the heat dissipation band member 42. The heat insulation band member 41 is excellent in adiathermic, and is made from a flexible material. For example, the heat insulation band member 41 can be made from synthetic resin, such as plastics material, rubber material, especially thermally conductive low polyurethane.

[0039] Insert molding of the heat dissipation band member 42 is carried out to the heat insulation band member 41. As shown in drawing 4 and drawing 7, the background of the heat dissipation band member 42 is covered with the heat insulation band member 41. Furthermore, it is a wrap about each side face and side front of a rim where side-attachment-wall section 41a in alignment with the longitudinal direction of the band in the heat insulation band member 41 and edge 41b on a side front met the longitudinal direction in the heat dissipation band member 42. And the material of the heat insulation band member 41 enters into a through tube 43. Thereby, the reinforcement of association of the heat dissipation band member 42 and the heat insulation band member 41 becomes large.

[0040] Thus, [ near / which was covered with the heat insulation band member 41 / the rim ], it exposes to the side front of a band 40, and the side front of the heat dissipation band member 42 contacts the open air. Since the background of a band 40 is covered with the heat insulation band member 41, the temperature of a wrist is obstructed by the heat insulation band member 41, and does not get across to the heat dissipation band member 42. Moreover, since a rim is covered with the heat insulation band member 41, the heat dissipation band member 42 does not damage a pocket person's wrist. Moreover, edge 41b of the heat insulation band member 41 projects towards a side front from the heat dissipation band member 42. Therefore, even if it throws somewhere the side front of a band 40, it is protected by edge 41b and the exposed heat dissipation band member 42 cannot get damaged easily. A band 40 is connected with a bezel 28. A joining segment with the bezel 28 in a band is shown in drawing 4 and drawing 6. The body of the heat insulation band member 41 projects to a longitudinal direction, and connection section 41c is formed. The lateral through tube 44 for connection is formed in connection section 41c.

[0041] On the other hand, it projects from the heat insulation band member 41, and extends on connection section 41c, and further, along with connection section 41c, towards a background, the end face section of the heat dissipation band member 42 breaks, and is bent. And contact section 42a located in the side front of connection section 41c and contact section 42b located in the side face of connection section 41c are formed. On the other hand, eaves 45 and the both-sides wall 46 are projected and formed in the joining segment by the side of a bezel. The hole 47 which counters a through tube 44 is formed in a both-sides wall. As shown in drawing 6, the joining segment of the band 40 containing the contact sections 42a and 42b is inserted between the both-sides walls 46 of a bezel. The spring rod 50 is inserted in holes 47 and 44, and a band 40 is connected with a bezel 28. At this time, the pressure welding of the contact section 42a of the heat dissipation band member 42 is carried out to eaves 45, and contact section 42b is stuck to the peripheral wall 51 of a bezel by

pressure. Therefore, the contact sections 42a and 42b are contacted by the bezel in a large area. Moreover, since the contact sections 42a and 42b of the heat dissipation band member 42 are located in the rear-face side of the eaves 45 formed in the bezel 28 and they are not visible from a pocket person, they do not spoil the appearance of a wrist watch.

[0042] Since it is such structure, the heat of a bezel 28 lets the contact sections 42a and 42b pass, and gets across to the heat dissipation band member 42 of a band 40. Air quenching of the heat dissipation band member 42 is carried out. Therefore, heat is radiated not only from the bezel 28 but from the heat dissipation band member 42. Therefore, the temperature of a bezel 28 becomes low conventionally and a temperature gradient with the back lid 24 which can be warmed by the wrist becomes large. The generating efficiency of a thermoelement 26 can be raised as a result.

[0043] (Second operation gestalt) A longitudinal direction sectional view and drawing 10 of the decomposition perspective view in which drawing 8 shows the second operation gestalt of this invention, and drawing 9 are longitudinal direction sectional views. Drawing 8 looks at some wrist watches from a flesh side. It measures that the second operation gestalt gathers the collector efficiency of the back lid of a clock. As shown in drawing 8 and drawing 9, a band 60 consists of a heat insulation band member 61 on a band side front, and a collection-of-heat band member 62 on a background.

[0044] The collection-of-heat band member 62 is made highly [ thermal conductivity, such as stainless steel, titanium, brass, and aluminum, ] with the metal plate of the thinness which can curve. As shown in drawing 10, many through tubes 63 are formed in the rim of the longitudinal direction both sides of the collection-of-heat band member 62. As for the heat insulation band member 61, adiathermic [, such as plastics material and rubber material ] is high, and it is made from a flexible material. For example, the heat insulation band member 61 is made from the polycarbonate which is thermally conductive low synthetic resin.

[0045] Insert molding of the collection-of-heat band member 62 is carried out to the heat insulation band member 61, and a band 60 is constituted. As shown in drawing 8 and drawing 10, the side face and rear face near the rim of both sides where the heat insulation band member 61 met the longitudinal direction of the band in the collection-of-heat band member 62 are covered and held, and the section 64 is formed. And at the time of insert molding, the synthetic resin of the heat insulation band member 61 enters into a through tube 63, and, thereby, a collection-of-heat band member and a heat insulation band member are combined strongly.

[0046] On the other hand, the contact section 65 by the projection of a large number prolonged in a band longitudinal direction is formed in the rear face of the collection-of-heat band member 62. The contact section 65 holds, is located between the sections 64, and is continuously formed with fixed spacing along with the longitudinal direction of a band. As for two or more contact sections 65, it is desirable to form over the rear-face perimeter of a band 60. Moreover, as shown in drawing 9 and 10, the contact section 65 holds and projects towards the background of a band 60 from the section 64. Therefore, when a wrist is equipped with a wrist watch, two or more contact sections 65 can contact the skin.

[0047] The joining segment with the bezel 59 in a band 60 is shown also in drawing 8. The body of the heat insulation band member 61 projects to a longitudinal direction, and connection section 61a is formed. Connection section 61a The through tube 66 for connection is drilled along a longitudinal direction. On the other hand, the end face section of the collection-of-heat band member 62 projects from connection section 61a of the heat insulation band member 61, and connection section 62a is formed. Two holes 74 which penetrate connection section 62a on the front reverse side are located in a line with a longitudinal direction.

[0048] On the other hand, the both-sides wall 68 which hangs from eaves 67 and eaves 67 is projected and formed in the joining segment by the side of a bezel 59. The hole 70 which counters a through tube 66 is formed in the both-sides wall 68. Connection section 61a of the heat insulation band member 61 of a band 60 is inserted between the eaves 67 of a bezel 59, and a side attachment wall 68, as shown in drawing 9, the spring rod 71 is inserted in holes 70 and 66, and a band is connected with a bezel 59.

[0049] And the end face section of connection section 62a of the collection-of-heat band member 62 is inserted in the crevice 73 of the back lid 72. The \*\*\*\* 76 which two holes 74 formed in

connection section 62a let pass passes the back lid 72, and is thrust into a case 21. Therefore, connection section 62a of the collection-of-heat band member 62 is fixed in the crevice 73 of the back lid 72. Connection section 62a of the collection-of-heat band member 62 is stuck to the crevice 73 of the back lid 72, and the heat of the collection-of-heat band member 62 is conducted on the back lid 72.

[0050] Since it is such structure, if a band 60 is wound around a wrist, the temperature of a wrist will get across to the contact section 65, since the contact section 65 is formed over all the rear faces of a band 60 -- a wrist -- temperature is mostly brought together in the collection-of-heat band member 62 through the contact section 65 from the perimeter. The temperature which got across to the collection-of-heat band member 62 gets across to the back lid 72. The back lid 72 can be warmed also with the heat transmitted from about [ that a wrist is contacted directly and it can warm at it ] and the collection-of-heat band member 62. Therefore, since the temperature of a back lid becomes high conventionally and the temperature gradient of a back lid and a bezel becomes large, the generating efficiency of a thermoelement 26 can be raised.

[0051] Since the side front of a band 60 is covered by the heat insulation band member 61 which consists of an adiathermic ingredient, area which touches the air in the collection-of-heat band member 62 can be made small. Air cooling of the collection-of-heat band member 62 is hardly carried out. Therefore, the temperature of the collection-of-heat member 62 which was able to be warmed by the wrist is highly maintainable as it is. Moreover, since the heat insulation member 61 protects a side front, the collection-of-heat member 62 cannot get damaged easily. Since the heat insulation member 61 has covered the side face of the rim in alignment with the longitudinal direction of the band in the collection-of-heat band member 62, and the edges-on-both-sides section on the back, a pocket person's wrist does not get damaged by the radiator material 62.

[0052] Furthermore, along with the longitudinal direction of a band, much contact sections 65 are continuing and, thereby, the touch area of the collection-of-heat band member 62 and a wrist can be made large. Therefore, the heat-conduction effectiveness of the collection-of-heat band member 62 and a wrist can be raised. Moreover, since a collection-of-heat band member can bend between the contact section 65 and the contact section 65, a band 60 can be flexibly incurvated along with a wrist.

[0053] Since connection section 62a of the collection-of-heat band member 62 does not project from the crevice 73 of the back lid 72, it does not damage a wrist by the rim of connection section 62a. Moreover, since connection section 62a of the collection-of-heat band member 62 is certainly positioned by the crevice 73 to the back lid 72, it can do an assembly easily. And the backlash of connection section 62a is inhibited by the crevice 73.

[0054] Moreover, the \*\*\* 76 for immobilization serves as a means to fix the back lid 72 to a case 21 while being a means to fix the collection-of-heat band member 62 to the back lid 72, this increases components mark and the number of assemblers -- it is fixable rattlingly that there is nothing and possible [ thermal conduction of the collection-of-heat band member 62 and the back lid 72 ].

[0055] Drawing 11 is the decomposition perspective view showing the modification of the second operation gestalt. In this example, it has projected from the hole 78 with which the heat insulation band member 61 had the perimeter of the collection-of-heat band member 62 formed in \*\*\*, and only the connection 65 was formed in the heat insulation band member 61. Other structures are the same as the second operation gestalt.

[0056] (Third operation gestalt) Drawing 12 is the band longitudinal direction sectional view of the third operation gestalt, and drawing 13 is a longitudinal direction sectional view. This operation gestalt is the combination of the first and second operation gestalt. The sign of dimorphism voice is given to drawing and explanation of structure is omitted.

[0057] As shown in drawing 13, in this example, like the first operation gestalt, the heat dissipation band member 42 is arranged on the side front of a band, and the collection-of-heat band member 62 is arranged like the second operation gestalt on the background of a band. The heat insulation band member 41 pinched between the heat dissipation band member 42 and the collection-of-heat band member 62 has wrapped the rim of the both sides of the longitudinal direction of the heat dissipation band member 42 and the collection-of-heat band member 62.

[0058] Air cooling of the heat of a bezel 28 is transmitted and carried out to the heat dissipation band member 42 of a band, and the temperature of a wrist gets across to the back lid 72 through the collection-of-heat band member 62. Therefore, the temperature gradient of a bezel 28 and the back lid 72 becomes large, and can raise the generating efficiency of a thermoelement 21 still more greatly.

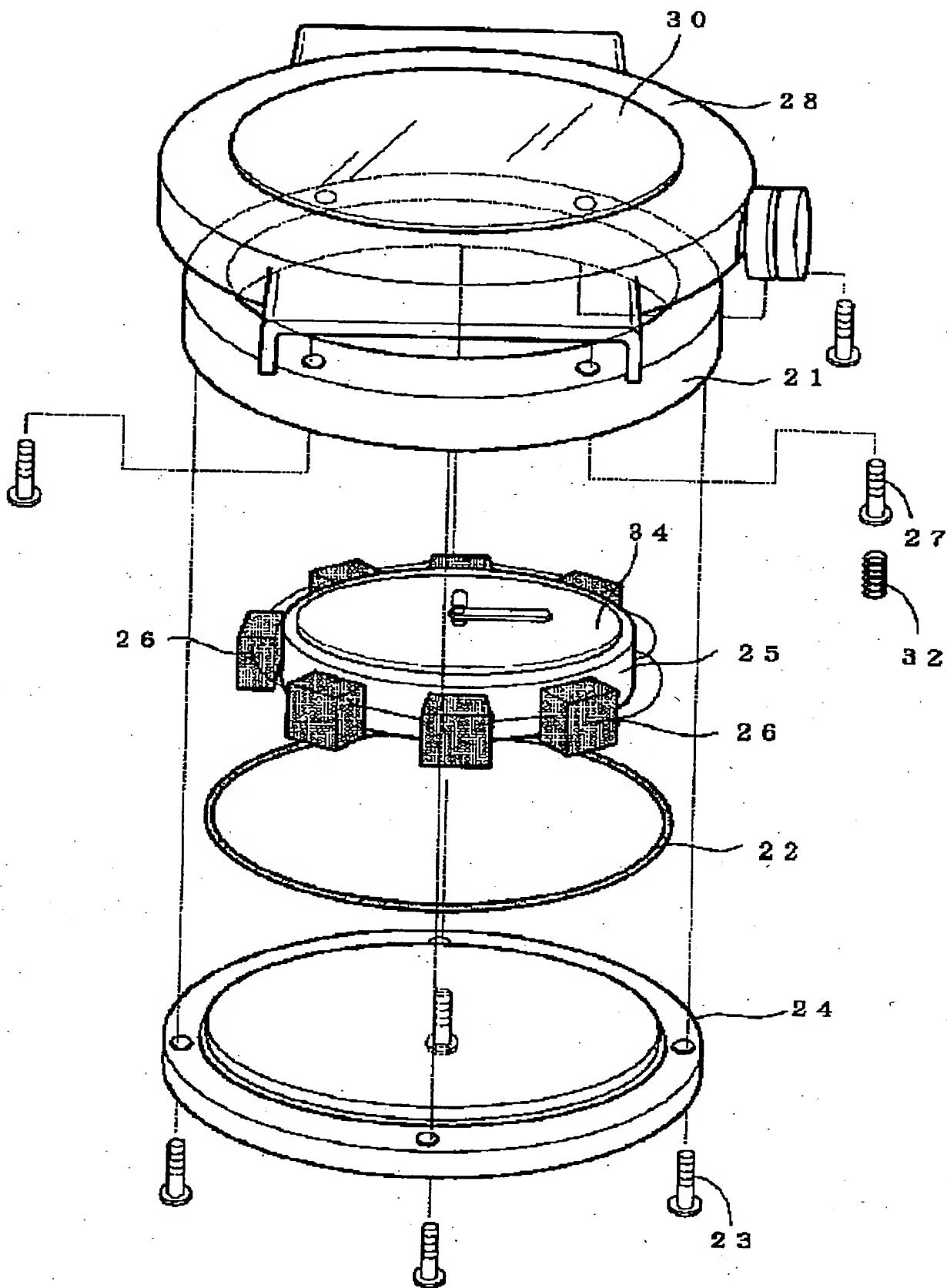
[0059] (Fourth operation gestalt) Drawing 14 is the side elevation showing the fourth operation gestalt. A heat generation-of-electrical-energy type wrist watch equipped with the band of C mold is shown by this example. In drawing, the left-hand side band 80 is made from the first operation gestalt, and the right-hand side band 81 is made from the second operation gestalt.

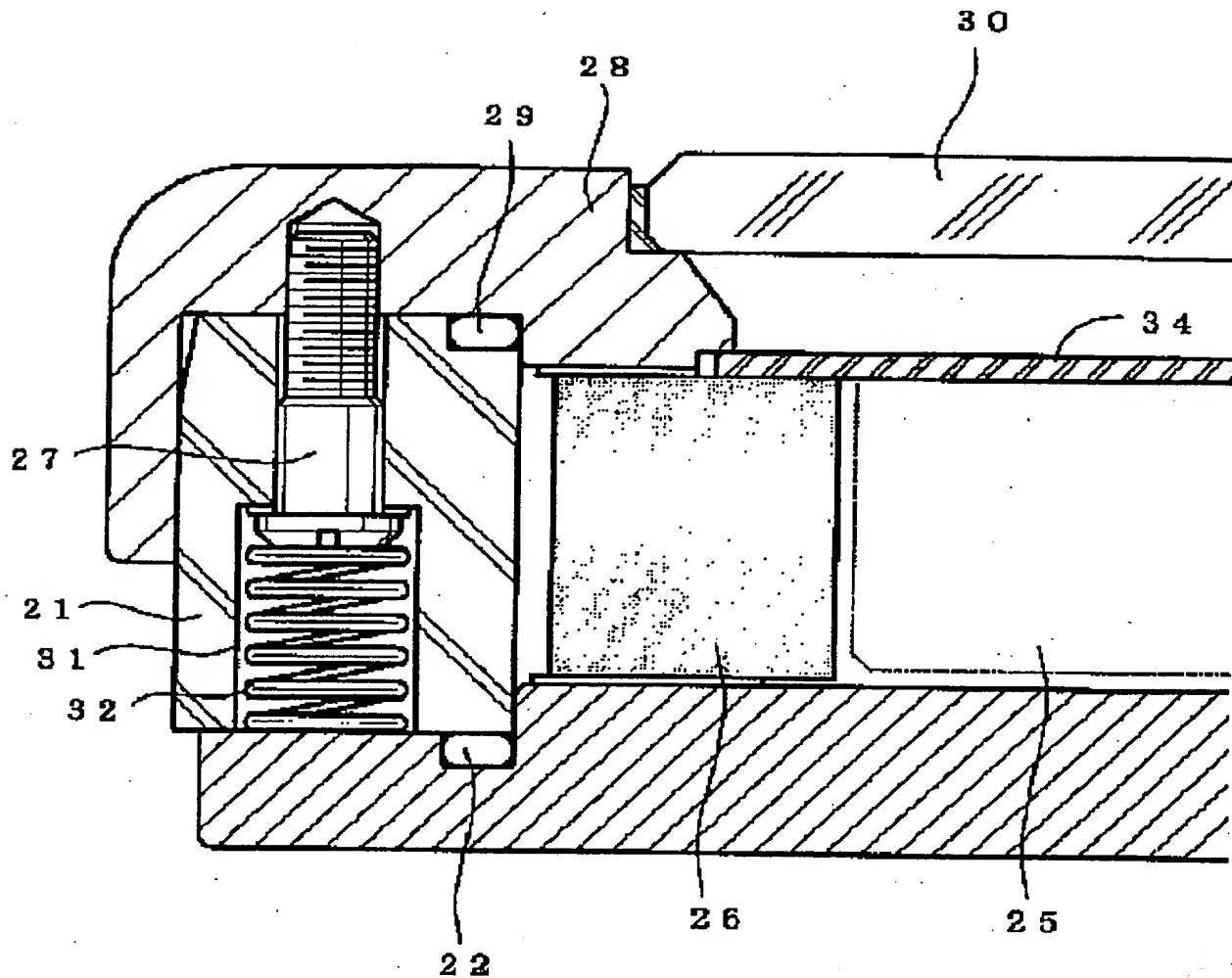
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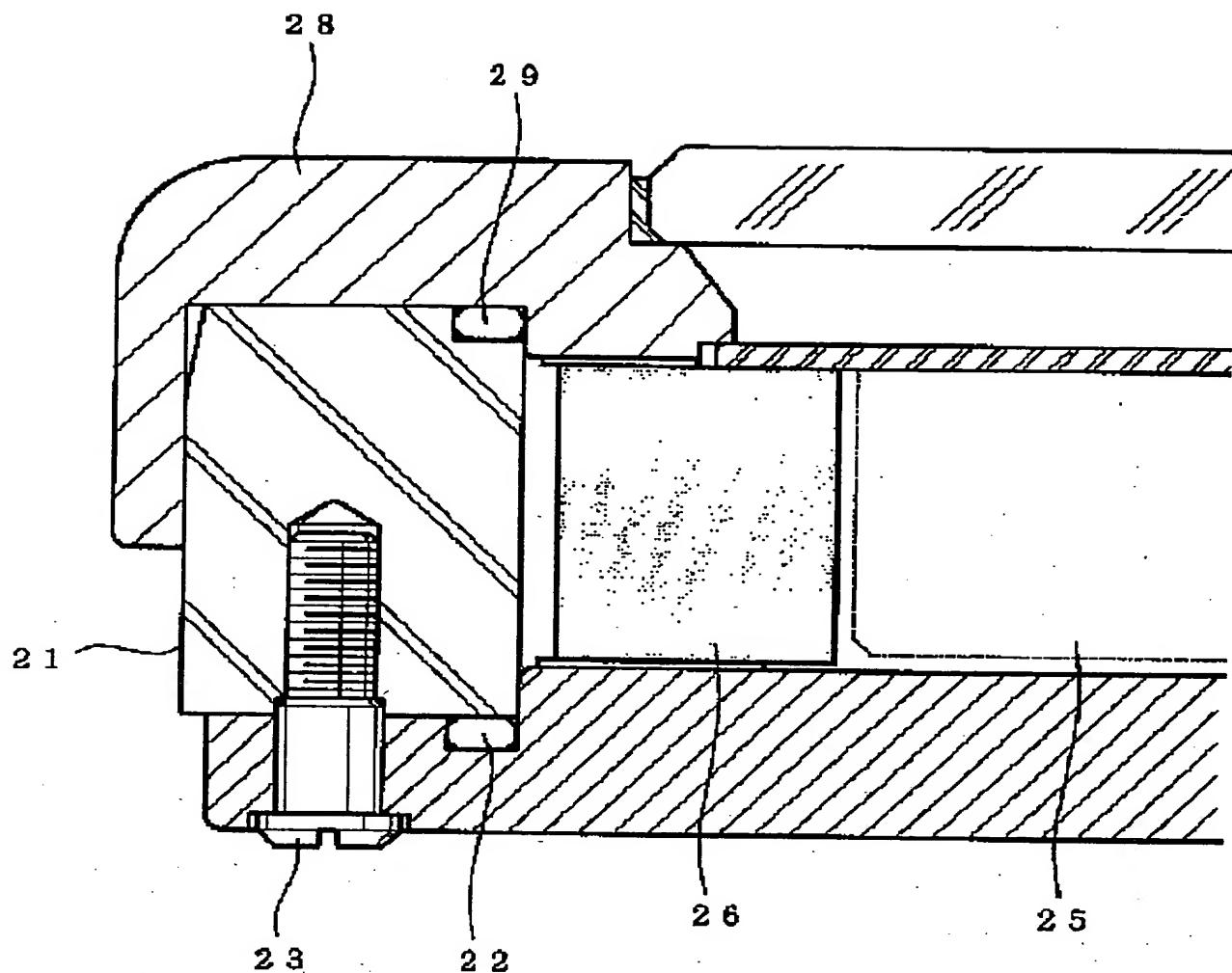
[Effect of the Invention] According to this invention, the temperature gradient of a bezel and a back lid increases and, thereby, the generating efficiency of a thermoelement can be raised.

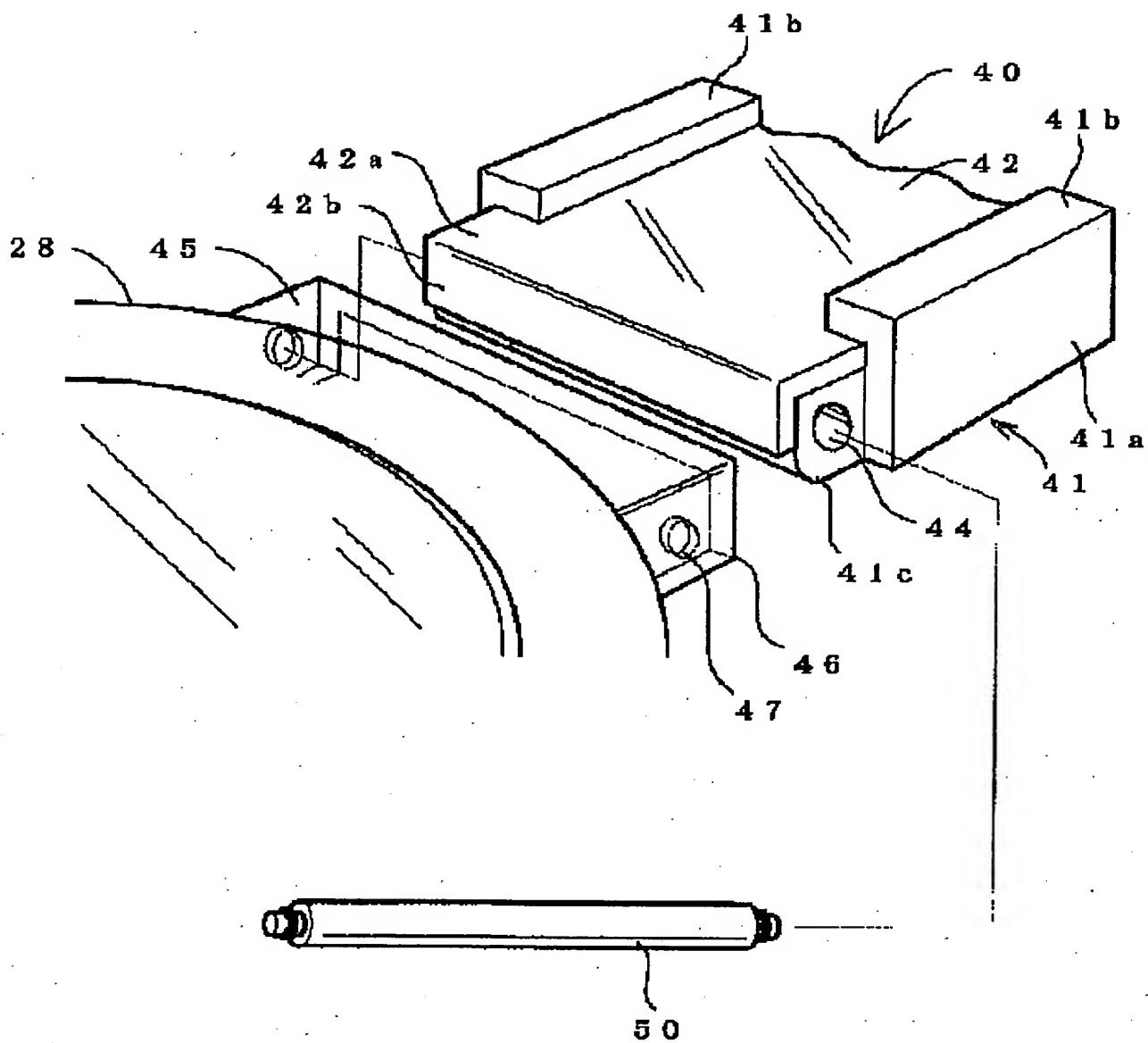
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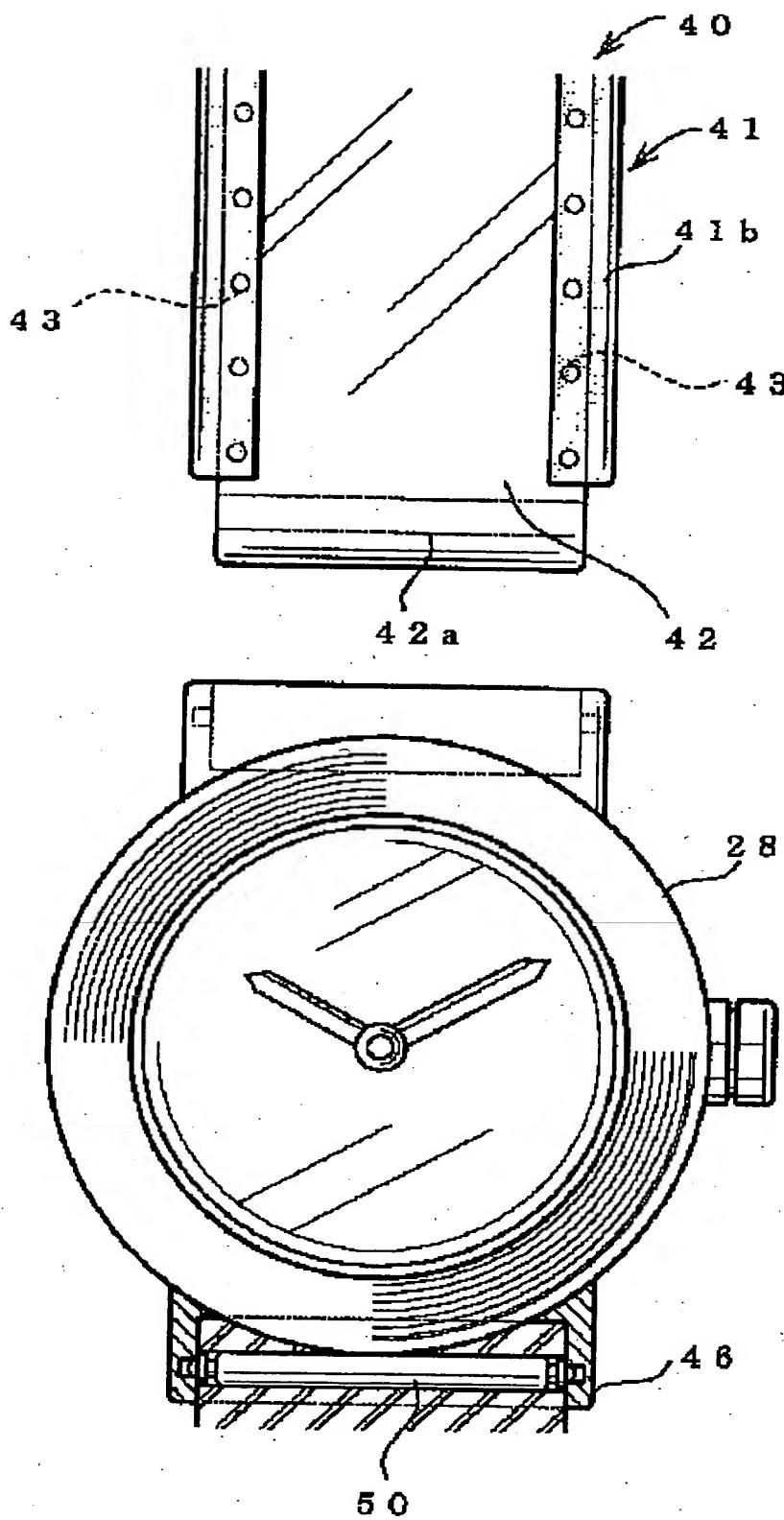
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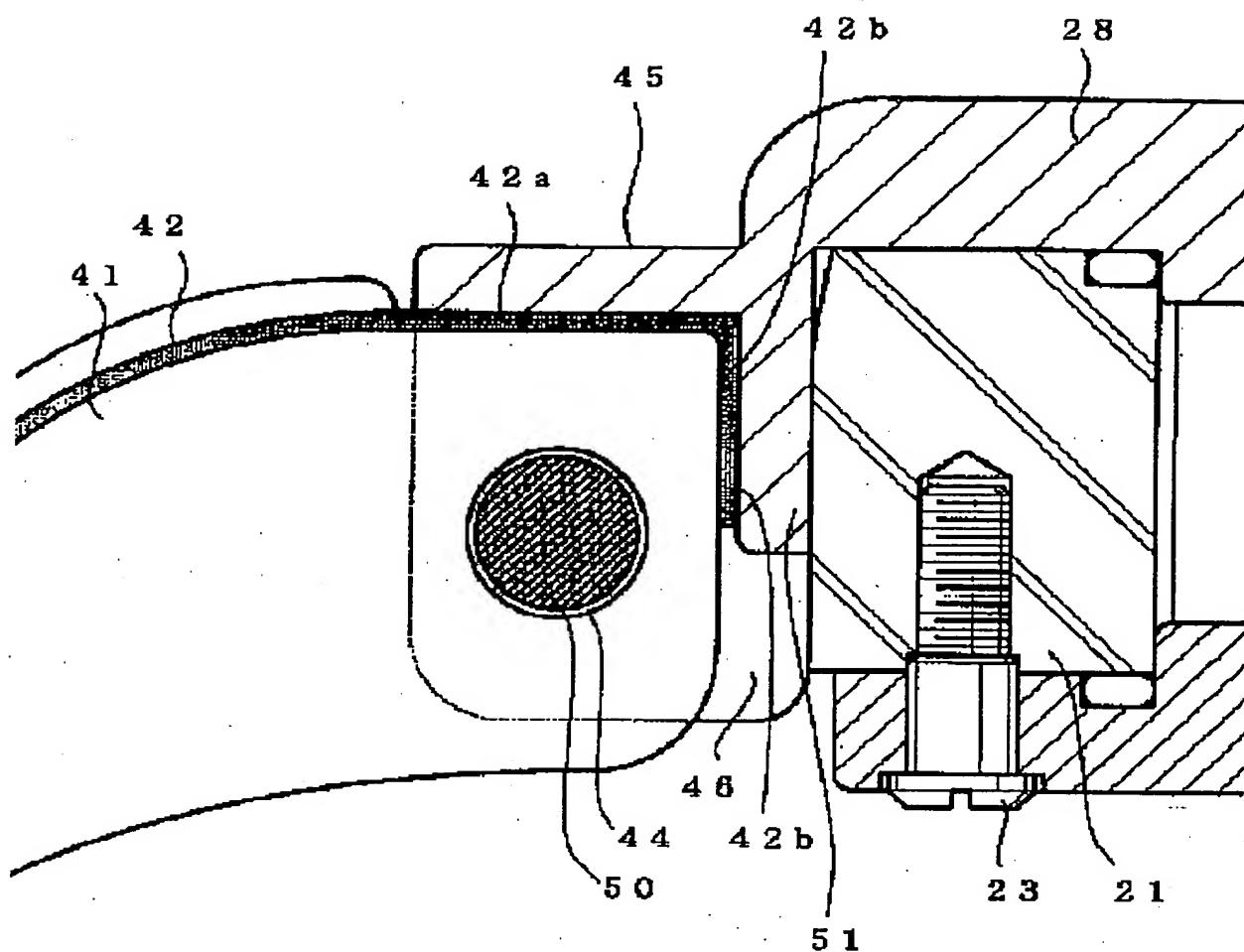


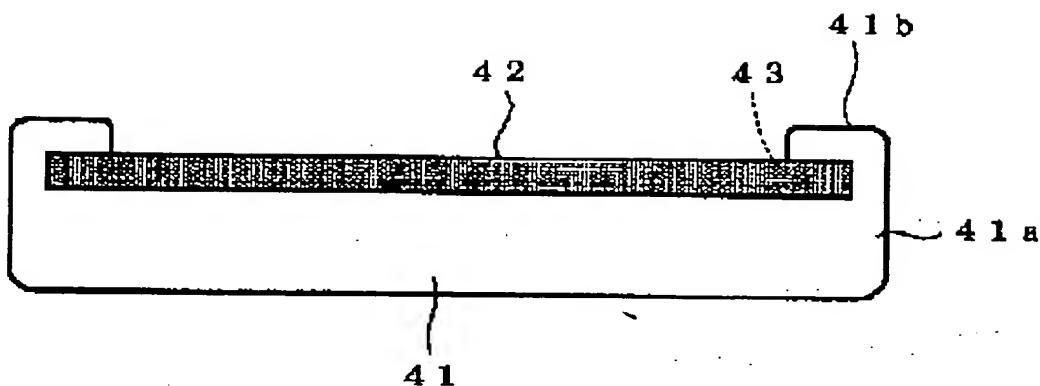


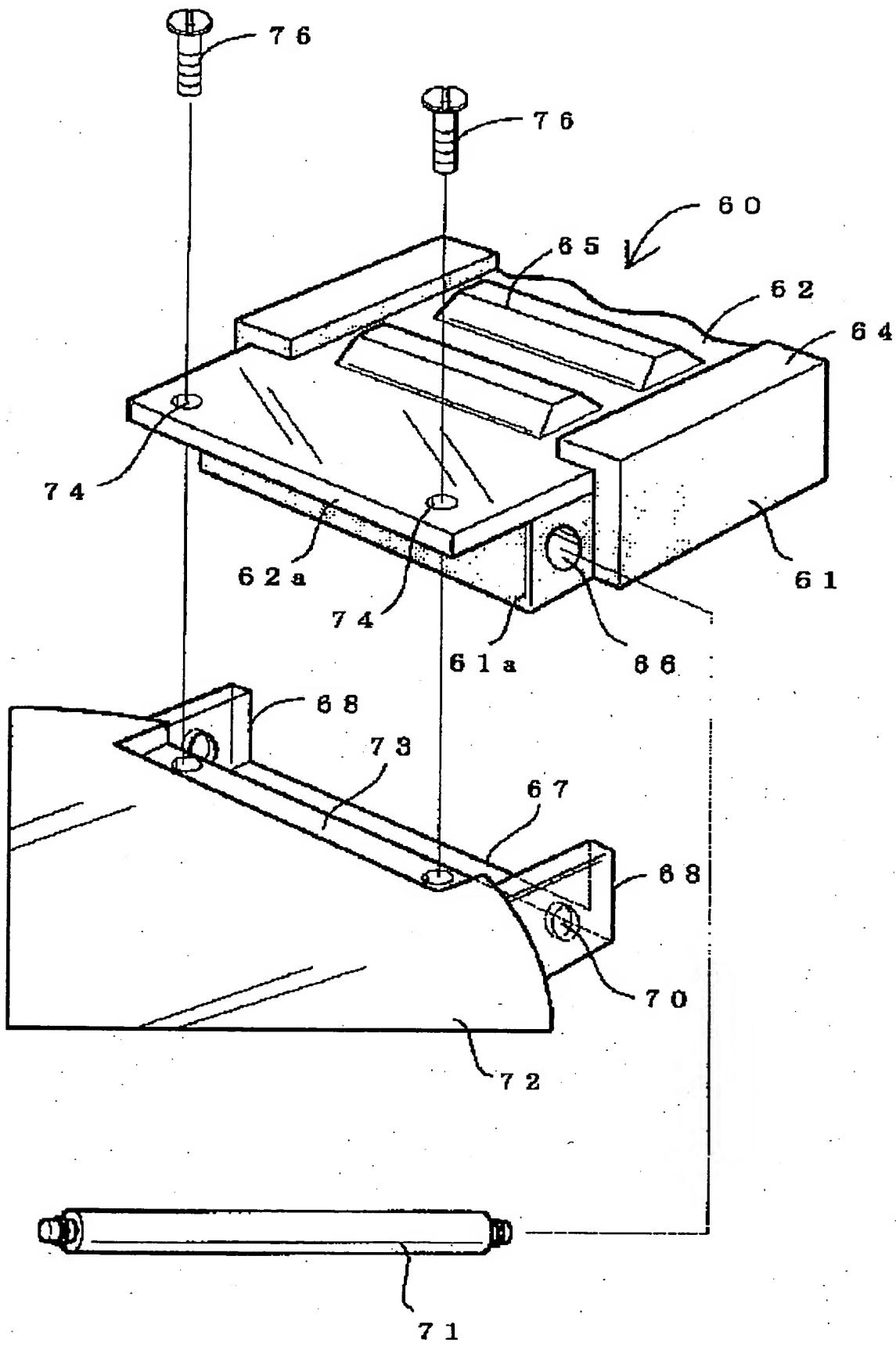


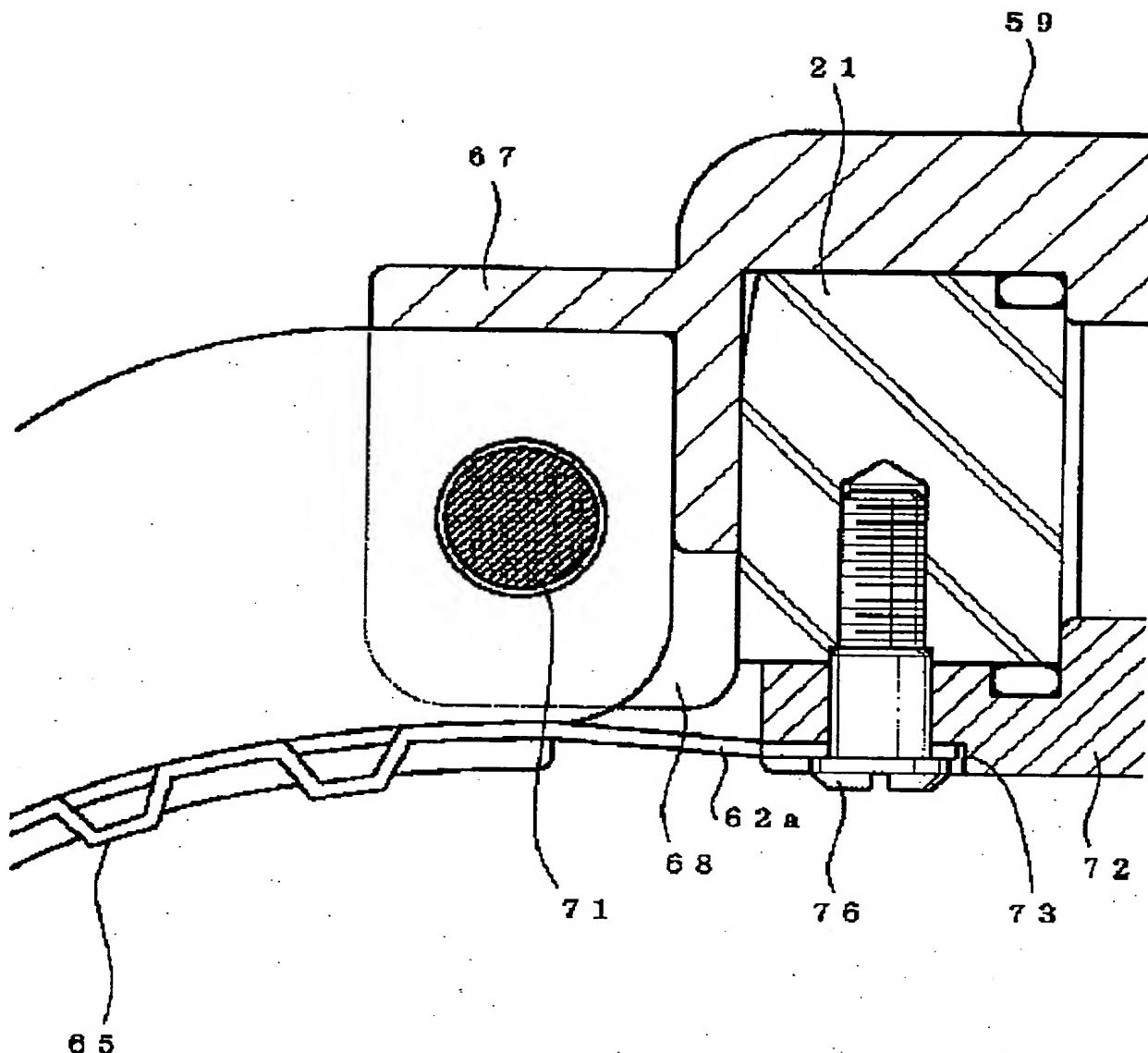


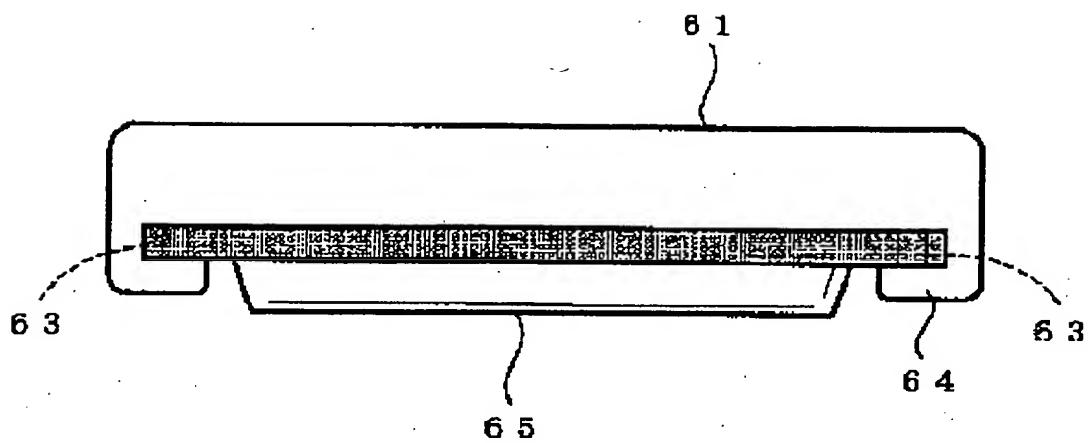


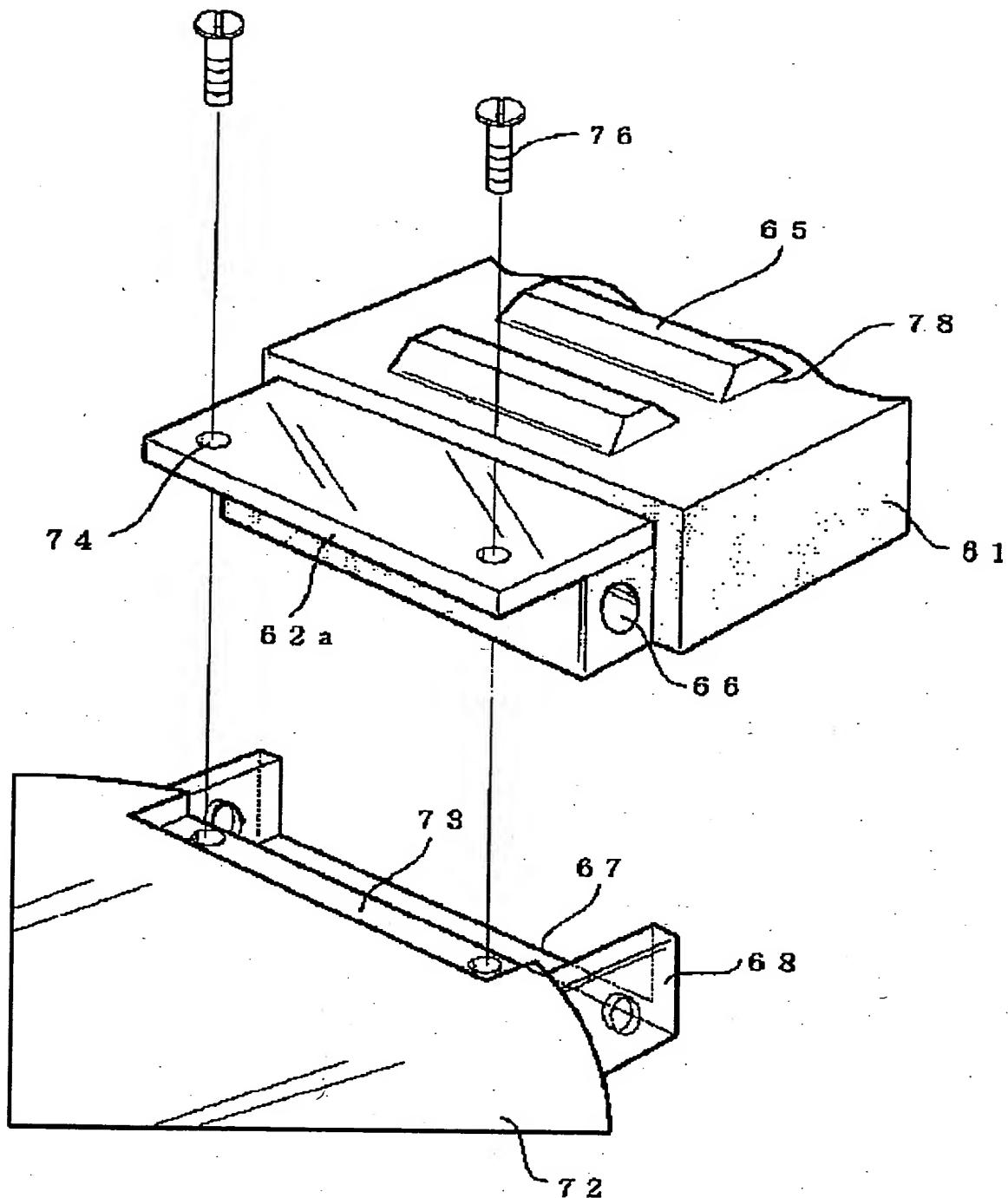


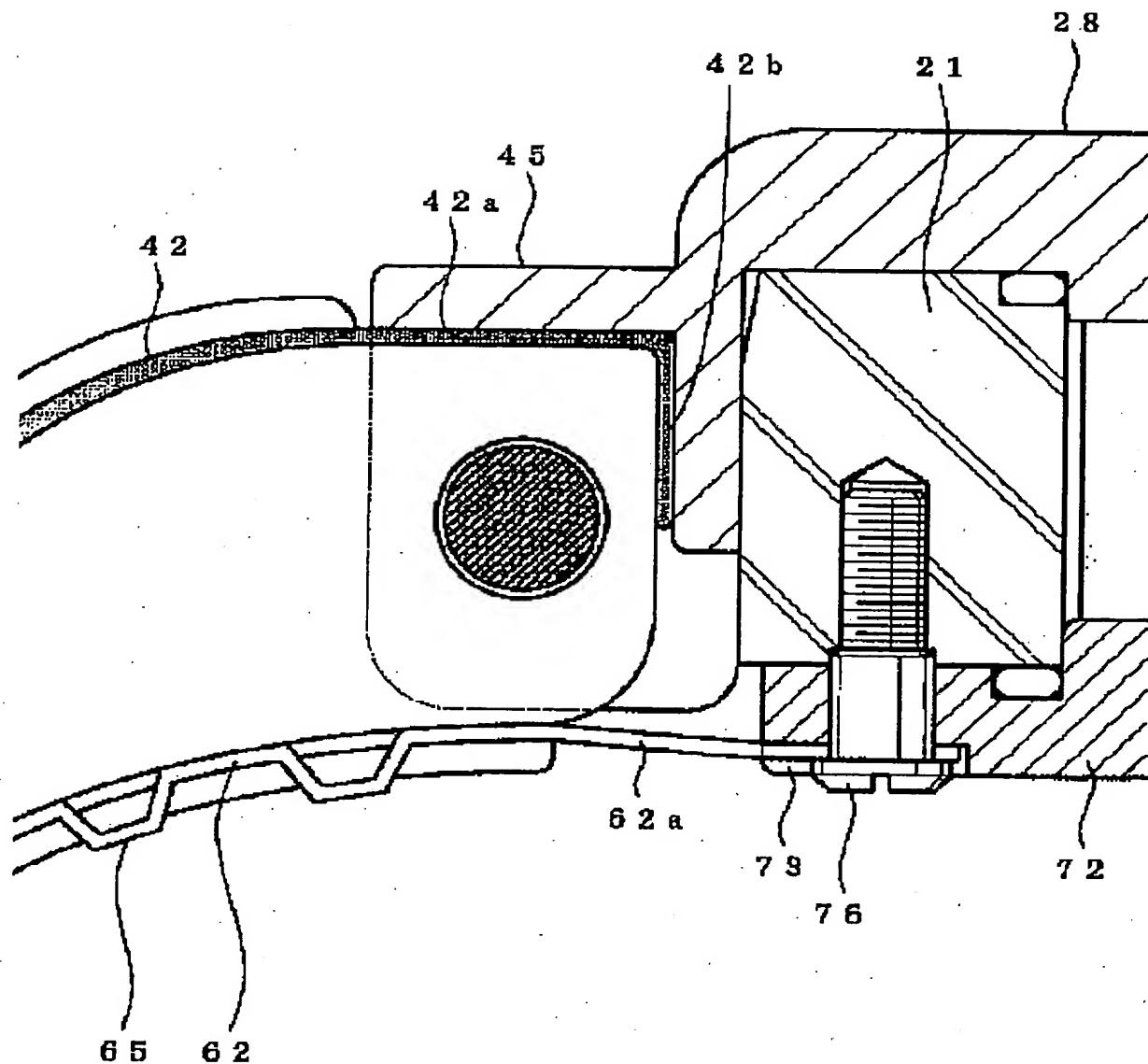


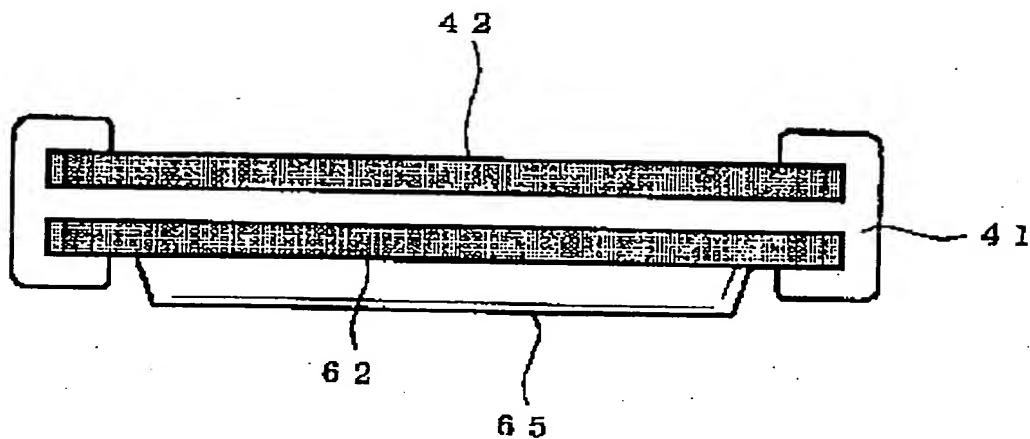


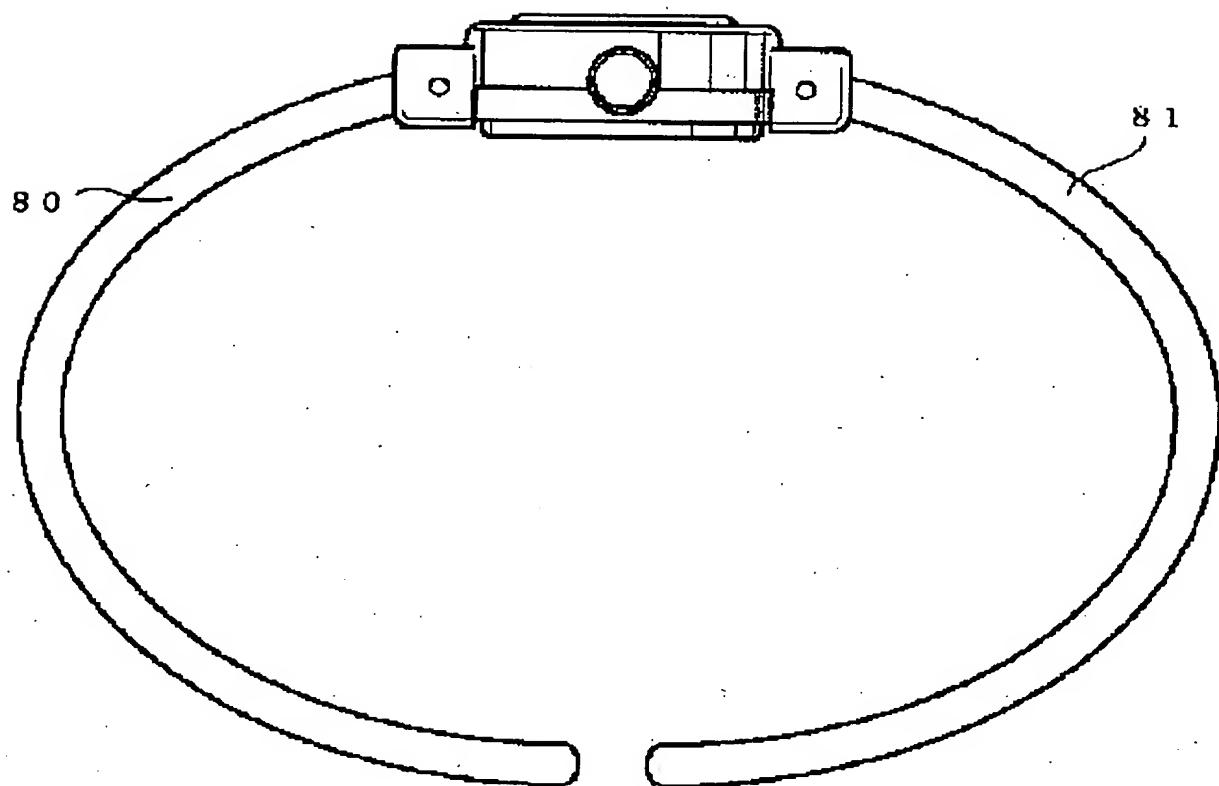


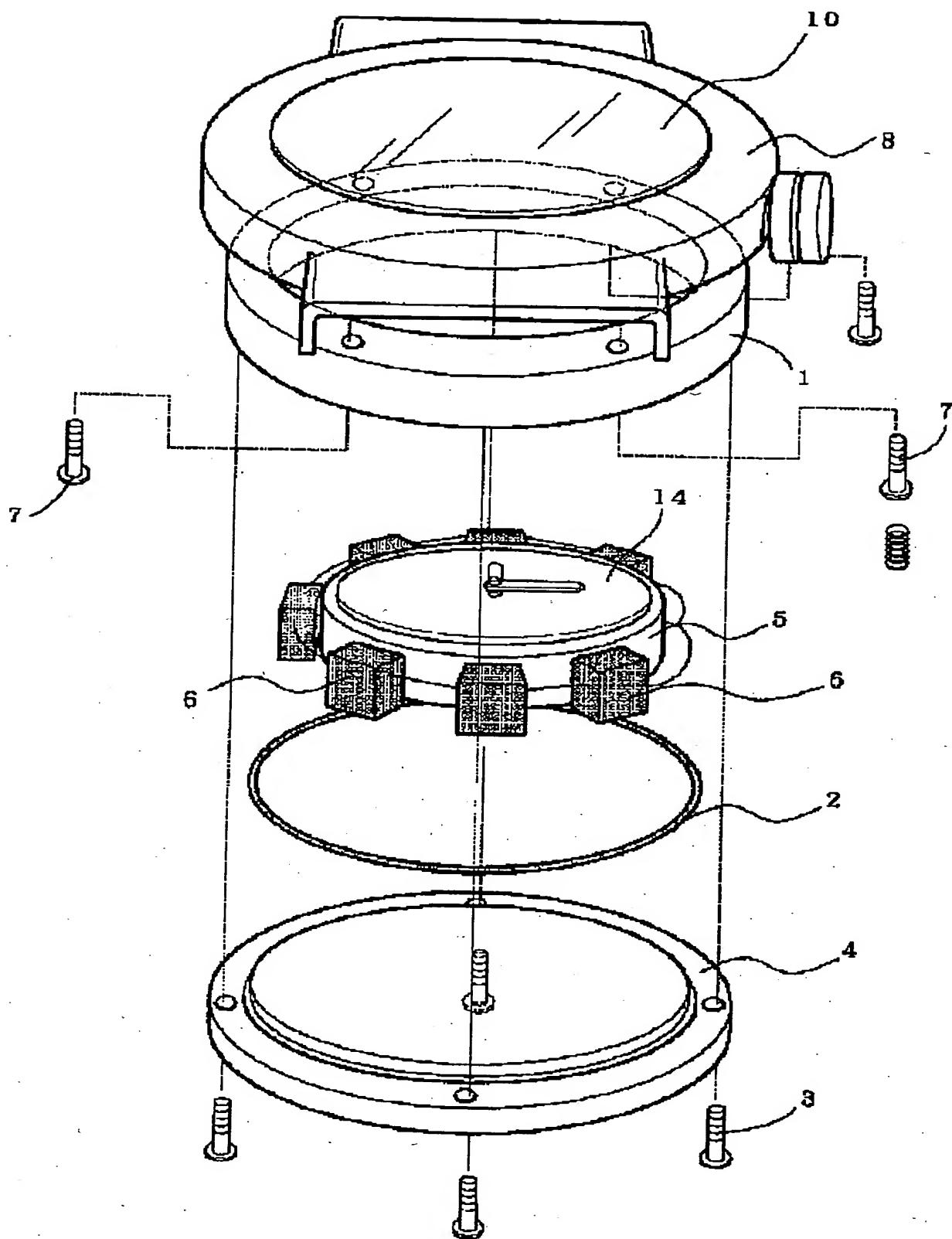


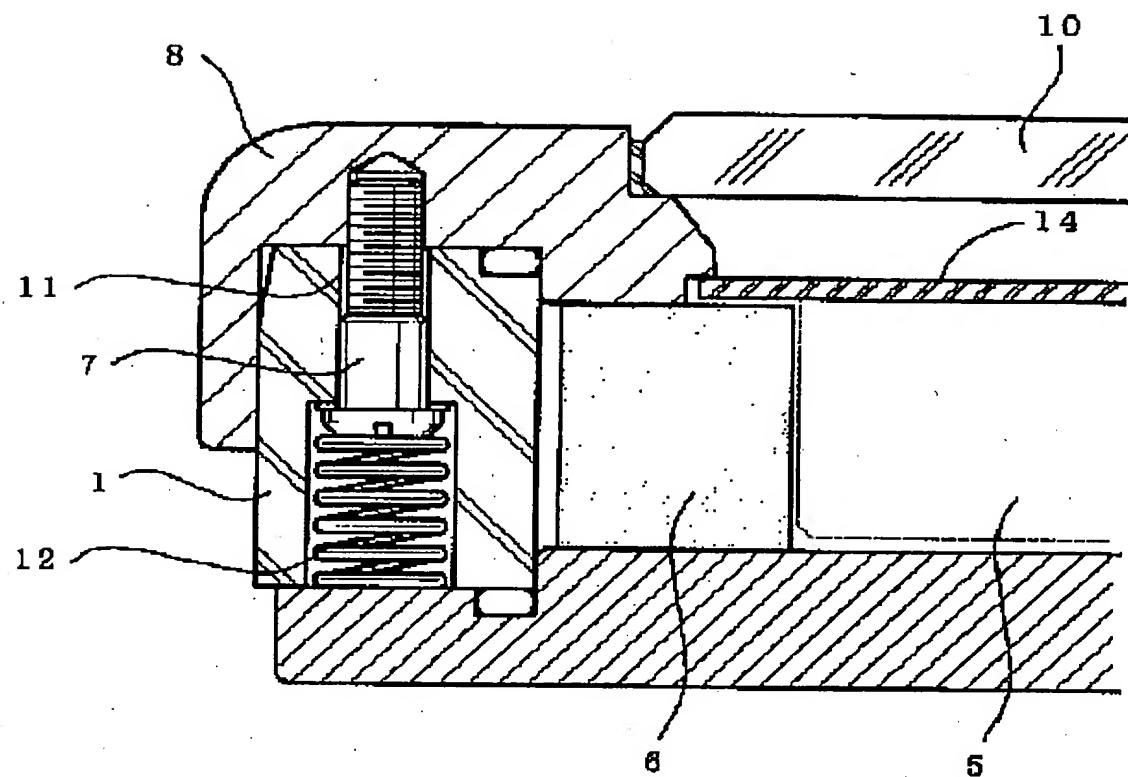


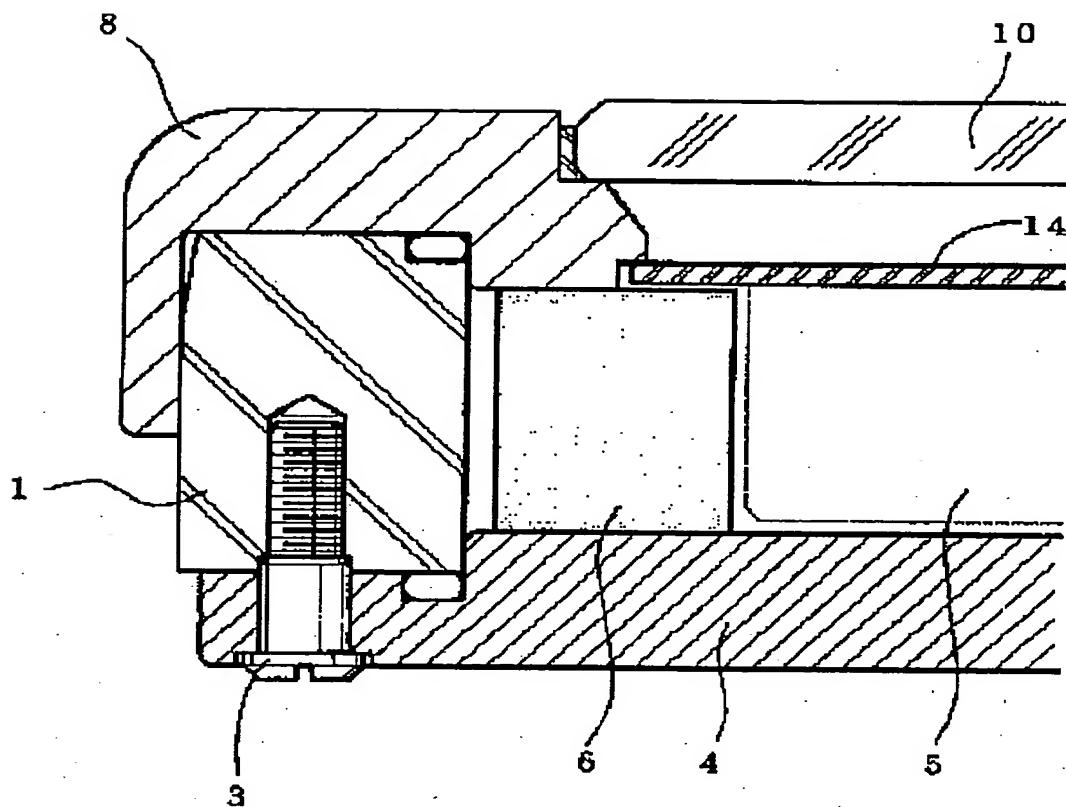












\* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

**CLAIMS**

[Claim(s)]

[Claim 1] The heat generation-of-electrical-energy type portable electronic device which is fixed to the upper part of the case which consists of an adiathermic ingredient, and its case, is fixed to the bezel which consists of a thermally conductive ingredient, and the lower part of a case, becomes the back lid which consists of a thermally conductive ingredient, and a bezel and a back lid from the thermoelement arranged possible [ thermal conduction ] and a thermally conductive ingredient, and consists of a band equipped with the improvement member which increases the temperature gradient of a bezel and a back lid.

[Claim 2] The heat generation-of-electrical-energy type portable electronic device by claim 1 to which an improvement member is characterized by being connected possible [ a bezel and thermal conduction of the heat dissipation band member ] by the heat dissipation band member exposed to the method of outside.

[Claim 3] The heat generation-of-electrical-energy type portable electronic device by claim 1 characterized by for the improvement member having consisted of a thermally conductive ingredient, and connecting the collection-of-heat band member with a back lid possible [ thermal conduction ] by the wrist and the collection-of-heat band member which can be contacted.

[Claim 4] The heat generation-of-electrical-energy type portable electronic device according to claim 2 which a heat dissipation band member exposes towards the side front of a band.

[Claim 5] Claim 2 covered by the heat insulation member which the background of a band becomes from an adiathermic ingredient, or a heat generation-of-electrical-energy type portable electronic device given in either of 4.

[Claim 6] A heat generation-of-electrical-energy type portable electronic device given in either of claims 2, 4, and 5 to which a part of radiator material located near the connection section with the bezel in a band contacts a bezel possible [ thermal conduction ].

[Claim 7] The heat generation-of-electrical-energy type portable electronic device according to claim 6 with which a part of radiator material contacts the rear face of the eaves formed in the bezel.

[Claim 8] The heat generation-of-electrical-energy type portable electronic device according to claim 6 with which a part of radiator material contacts the side face of a bezel.

[Claim 9] Claim 2 which combined the heat insulation member which turns into radiator material which consists of a metal plate which can curve from flexible synthetic resin or rubber, and was used as the band, and a heat generation-of-electrical-energy type portable electronic device given in either 4-8.

[Claim 10] A heat generation-of-electrical-energy type portable electronic device with a heat insulation member given in wrap claim 9 near the rim in alignment with the longitudinal direction of the band in radiator material.

[Claim 11] The heat generation-of-electrical-energy type portable electronic device according to claim 10 which a wrap heat insulation member turns to a side front near the rim of radiator material from radiator material, and projects.

[Claim 12] A heat generation-of-electrical-energy type portable electronic device given in either of claims 9-11 by which insert molding of the radiator material is carried out to a heat insulation member.

[Claim 13] The heat generation-of-electrical-energy type portable electronic device according to

claim 3 which a collection-of-heat member exposes towards the background of a band.

[Claim 14] Claim 3 covered by the heat insulation member which the side front of a band becomes from an adiathermic ingredient, or a heat generation-of-electrical-energy type portable electronic device given in either of 13.

[Claim 15] A heat generation-of-electrical-energy type portable electronic device given in either of claims 3 and 14 which a part of collection-of-heat member located near the connection section with the bezel in a band contacts possible [ a back lid and thermal conduction ].

[Claim 16] The heat generation-of-electrical-energy type portable electronic device according to claim 15 by which a collection-of-heat member is fixed to a back lid possible [ thermal conduction ] with a fixed means to fix a back lid and a case.

[Claim 17] The heat generation-of-electrical-energy type portable electronic device according to claim 16 with which a collection-of-heat member is arranged in the crevice formed in the rear face of a back lid.

[Claim 18] The heat generation-of-electrical-energy type portable electronic device according to claim 17 with which a collection-of-heat member does not project in the method of outside [ crevice / of a back lid ].

[Claim 19] Claim 3 which combined the heat insulation member which turns into a collection-of-heat member which consists of a metal plate which can curve from flexible synthetic resin or rubber, and was used as the band, and a heat generation-of-electrical-energy type portable electronic device given in either 13-17.

[Claim 20] A heat generation-of-electrical-energy type portable electronic device with a heat insulation member given [ the rim in alignment with the longitudinal direction of the band in a collection-of-heat member ] in wrap claim 19.

[Claim 21] The heat generation-of-electrical-energy type portable electronic device according to claim 20 which has the contact section in which a collection-of-heat member projects towards a background from a heat insulation member.

[Claim 22] The heat generation-of-electrical-energy type portable electronic device according to claim 21 with which two or more contact sections continue at the predetermined spacing along with the longitudinal direction of a band.

[Claim 23] A heat generation-of-electrical-energy type portable electronic device given in either of claims 17-22 by which insert molding of the collection-of-heat member is carried out to a heat insulation member.

[Claim 24] The heat generation-of-electrical-energy type portable electronic device by claim 1 which consists of the heat insulation band member which a band member turns into from an adiathermic ingredient, a heat dissipation belt member which was prepared in the top face, consisted of a thermally conductive ingredient, and was connected with the bezel, and a collection-of-heat band member which was prepared in the inferior surface of tongue of a heat insulation belt member, consisted of a thermally conductive ingredient, and was connected with the back lid.

[Claim 25] The heat generation-of-electrical-energy type portable electronic device by claim 1 characterized by being the collection-of-heat band member which the band member was prepared in one band and consisted of a thermally conductive ingredient, and is a heat dissipation belt member connected with the bezel, and was prepared in the band of another side, consisted of a thermally conductive ingredient, and was connected with the back lid.

[Translation done.]